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NATURAL HISTORY

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1954

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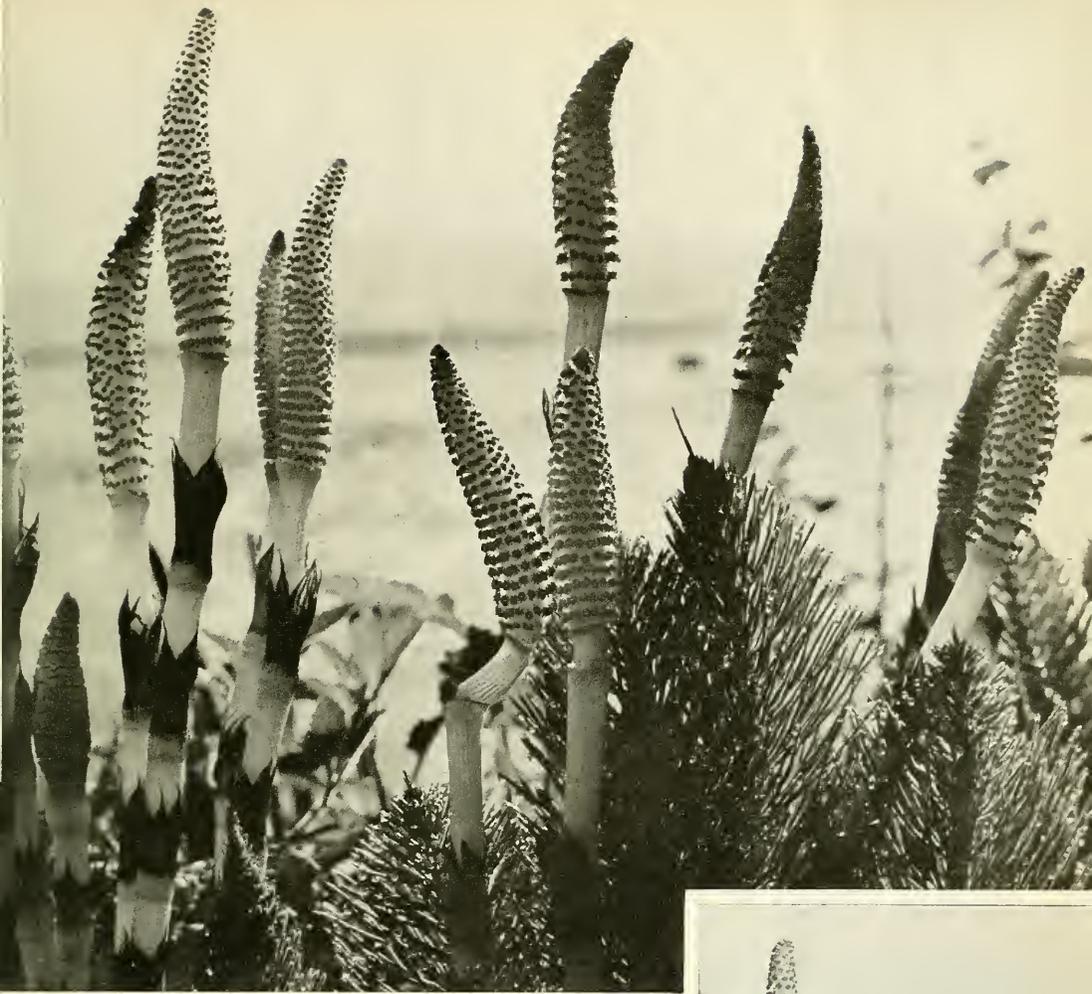
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LETTERS

Horsetails

SIRS:

I was delighted with John H. Gerard's account and photographs of the horsetail, *Equisetum*, in your October issue. Perhaps your readers would be interested in the accompanying two photographs of a species whose fertile spikes make an attractive subject for the photographer. By shooting from a low angle, one can obtain results that might well suggest the appearance of the swampland forests of 280 million years ago. The sterile shoots below them remind one of a forest of miniature pine trees. I am afraid, though, that it would be difficult to duplicate the two-foot dragonflies and four-inch cockroaches that lived in the days of the prehistoric horsetails.

WOODY WILLIAMS

Inverness, Calif.

Perils Under the Sea

SIRS:

It was delightful to read Osmond P. Breland's interesting article entitled "Harmless or Deadly?" in your November issue. For many years I have explored the insect world here and in other lands, besides having done considerable undersea work during the more than thirty years I was connected with the American Museum's Department of Marine Invertebrates.

Many of the dangers Dr. Breland mentions are well known to those who explore nature's wonderlands. It behooves the inquisitive to investigate cautiously, for most creatures are more or less ready to defend themselves against intrusion. Some deliberately sting, bite, or eject their venom, while others have a more passive method of protection.

Three of the "passive perils" might be mentioned, because they are often met in diving among the coral reefs. **The**



first and most common is the sea urchin (formerly *Diadema setosum* but now called *Centrochinus antillarum*), which is plentiful in the West Indies. It has long black, poisonous spines. I was warned against picking up this pincushion, but I thought that if I got a good hold on several of the spines, the rest could do nothing to my hand. I was sadly mistaken, for the neighboring spines immediately moved over, struck into the sides of my fingers, broke off their ends, and left me with them under the skin. There was nothing to do but get back on board and, with razor blade and needle, spend the next half hour digging out the spines before they started to fester.

Another quite dangerous creature, also belonging to the Echinoderm group, is a large starfish that was common in the pearl divers' lagoon at Tongareva, probably *Acanthaster planci*. The full-grown ones are 18 to 20 inches across and purplish-brown, with sixteen rays. The upper surface of these creatures is closely covered with thousands of scarlet-red spines an inch to an inch and a half long, as sharp and brittle as glass. Should the diver accidentally set his foot on top of this creature, these spines will penetrate and break off, leaving hundreds of the tips under the skin. We were warned by the native divers at Tongareva that these red spines were very poisonous and would lead to serious infection if not taken care of right away. However, the natives also told us that there was a quick and sure cure for such an infestation. Strange as it may seem, the creature itself would right the wrong. The thing to do was to get the starfish up into shallow water and with a stick or something turn it over on its back. You then should stick your injured foot into its mouth-part, and the creature, we were told, would immediately begin to

suck out all the red spine ends. After proper cauterization, the troubles of a poisoned wound in your foot would be avoided. Actually, we never had occasion to try this.

The third creature that nature has apparently supplied with a defensive poison is not exactly a single individual but a colony of minute creatures that are like the coral polyps in shape and form and build up a limestone skeleton. In fact, the colony is often called the stinging coral or "pepper coral." The scientific name is *Millepora alicornis*. It has an unusual stinging power, to which many persons are sensitive. If the tender skin comes in contact with the surface of this Hydrocoralline, thousands of minute defense polyps inject a poison into the pores of the skin, producing a burning sensation much like a nettle burn. It can be very painful.

In all our many trips exploring the undersea, we met or saw many of the animals mentioned in Dr. Breland's article. Two that worried us most were the shark and the barracuda. Either might appear when you least expected them. Fortunately nothing serious ever happened. We firmly believed that our best chance of being unnoticed by these fellows was to remain very still in their presence. We felt that as long as the creature was not aroused to excitement, he would pass by, taking us as part of the undersea landscape. In this manner we eluded both the shark and the barracuda on several occasions. As long as this worked, we preferred not to test the theory, apparently true, that some sharks can be scared away by commotion.

CHRIS E. OLSEN

West Nyack, N. Y.

Panther Screams

Sins:

Edgar Perry has raised the old question again, "Does a Panther Scream?" in NATURAL HISTORY MAGAZINE for October, 1953.

I can answer that question definitely. I not only heard but stood close by and watched an American female panther (puma, cougar, mountain lion) scream repeatedly.

When I had my office at 100 Central Park South (1921-27), one warm day when I happened to have a window open for ventilation, I heard a most peculiarly piercing, very high-pitched, wailing scream from the direction of the Zoo in Central Park. The scream was repeated so many times that I decided to go to the Zoo at lunch time and see what kind of animal was making it, for it seemed to be a cry of pain. Being a physician I thought if this was so I might see someone in authority who could relieve it.

The scream, I found to my astonishment, was made by a female American panther. She was lying on her side in a

cage alone, and without apparent effort (as compared to the lion, tiger, or other vocalizing animal) she would make this piercing, long-drawn-out, wailing, cat-like scream. I watched it for at least ten minutes. Her voice had penetrated through all the din of traffic to my office about a quarter of a mile away. I recall that I asked a guard if she was ill, and he replied, as if he knew, that she was probably in heat. With this explanation, I made no effort to call the attention of the manager of the Zoo to her condition.

The amazing thing about her screams was the almost effortless manner in which they were made, the thin, extremely high-pitched, long-drawn-out, wailing quality and distant penetration, through all the clang, din, and roar of city street-car and automobile-honking traffic. At night in a still forest or on a mountain side, such screams could probably be heard for a mile or more. They would no doubt seem, to many people, to come from an animal or human in great distress, and have such an eerie, hair-raising quality that the old pioneers' descriptions of the scream of the panther were quite realistic. I do not think that such people would have confused it with the scream of an owl.

DR. EDWARD J. KEMPF

Wading River, N. Y.

Sins:

With reference to your article "Does A Panther Scream?" (October, 1953), I wish to tell you of an experience my mother had when she was a girl living on Lookout Mountain in Georgia. She and a girl friend had been out picking berries and were carrying their baskets home when the other girl saw a big male panther following along behind them. When they got to a creek they had to cross, the panther stood up on his hind legs and screamed like a woman in agony. My mother said she had never heard anything like it before. Then the panther jumped over the creek and began following them again. He finally turned and left them as they approached home, but only after rising on his hind legs again and repeating the scream several times.

CECIL A. YOUNG

Houston, Texas

Sins:

I want to compliment you very highly on your new face on the October issue of NATURAL HISTORY. It's really a beauty. You have a most wonderful magazine. I have enjoyed it a great deal.

I enjoyed the article entitled "Does A Panther Scream?" Am I correct in the impression that cheetahs are the tamest and fastest of the cat family? I read somewhere that they were used for hunting in India in early days. Am I right?

ALBERT POWERS

Ashland, Kans.

Cheetahs live wild in Africa and Asia. The ones in Africa, being the larger and swifter, are preferable for the hunts that are still carried on in India. In their domestication and training, the cheetahs take kindly to their keepers and respond

continued on page 48



◀ WHEN asked if Christine helped her in the writing of her articles, Lilo Hess sent this photo and said, "Only with the spelling."

NATURAL HISTORY

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scientific thought and opinion in exploration, research and the world of nature*

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January, 1954

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A Wei-Wei Indian Girl from British Guiana Cover Design
From a kodochrome by Nicholas Guppy

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*This wonder tree of the tropics yields a rich milk that is popular among the natives and
can scarcely be distinguished from fresh cream*

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William A. Burns

Assistant to the Director
American Museum
of Natural History



A WORLD FULL OF HOMES

with pictures by
Paula Hutchison
Museum Art Department

Throughout history and all over the world, man has utilized the materials at hand to provide shelter from the elements for himself and his family. This book is a fascinating account of the ingenious ways in which he has built his homes, from caves and tree houses through adobe huts and log cabins, right up to the most modern of glass houses.

Dr. Burns gives suggestions on how to make models of some homes he describes, and there is a special, and very amusing, section on unusual homes of the world. Many beautiful and detailed drawings add interest to the lively and informative text.

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William Beebe: A Naturalist Looks at New York • Deer
Jewelry • Moon • Amazon Town • Mountain Climbing

UNSEEN LIFE OF NEW YORK AS A NATURALIST SEES IT

by William Beebe

Duell, Sloan & Pearce, New York.
Little, Brown & Co., Boston.
\$4.00, 165 pp.

THIS is William Beebe at his delightful best as a professional scientist writing for the enlightenment of the common or garden variety of unscientific citizen. In this, his twenty-third book, he has limited his area of observation to a sphere with a radius of 100 miles and the Empire State Building in New York City as its center. However, Dr. Beebe takes the long view of this segment of earth, sky, and water and all the living creatures therein or thereon. He notes that the solid rock upon which the topless towers of Manhattan have been erected was formed some 2,000,000,000 years ago, conservatively speaking. He ticks off a few of the prehistoric monsters who left fossil footprints on the red sandstone of Time not far from where the Wall Street bulls and bears now stage their struggles. He mentions the last glacial grinding of the exposed surface of Westchester real estate some 20,000 years ago as a comparatively recent event. He tells the reader that fourteen different kinds of snakes have been found in New York City, over 200 species of birds have been recorded in Central Park, and he himself trapped eleven mink on the Bronx River where it runs through the Bronx Zoo a few hundred yards from the little building in which he worked for two score years as the Director of the Department of Tropical Research of the New York Zoological Society.

The "unseen life" of New York City and vicinity, Dr. Beebe explains, is unseen for a number of reasons, to which he gives such chapter headings as "Too Old To Be Seen: The Record Of The Rocks," "Too Small To Be Seen," a reference to microscopic life, "Too Dark To Be Seen," the night lives of wild creatures, and "Too Deep To Be Seen," meaning the submarine life in the waters of New York City and the great Hudson Gorge to the southeastward. These would be weighty subjects in some hands, but Dr. Beebe is, as always, deft and lighthearted in his presentation of scientific facts. The drawings of Donald T. Carlisle admirably and amusingly complement the work of the author.

JOHN KIERAN

JEWELRY FROM 1100 TO 1870

by Joan Evans

Pitman Publishing Company, \$17.50
240 pp., 221 illus.

LOVERS of fine jewelry may be shocked to learn that Dr. Evans does not feel that the jewelry that has been made since 1870 is of any very great significance in the history of the jewelry art. Dr. Evans' bias can be easily understood after reading her new book. Her reasons for concluding with 1870 are related to conditions of supply (diamonds from South Africa then started to flood the market), to conditions of manufacture (the first machine-made collet was marketed), and to conditions of a political character (the fall of the Second Empire and the end of royal patronage of the arts.)

Dr. Evans is the greatest authority on the history of jewelry. Her first book came out over 30 years ago, and she has been studying and writing on many aspects of jewelry ever since. This great work is really the summation of her studies and is magnificently illustrated in black and white and in color. The plates in the rear follow her chapter sequence, so that one keeps following along in both parts of the book as one reads. At times, her phraseology is a little hard to follow, but it is difficult to express oneself simply in this field. At the conclusion, one is almost inclined to agree with her pessimistic prediction, that jewelry has no future. What the "modern jewelers" have produced up to now does nothing to allay this fear.

The historical sequence of the book, which traces the development of jewelry from the Medieval period to the Victorian, makes it very clear how the emphasis has shifted from the art of the goldsmith, the enameler and the sculptor, to the beauties of nature itself, embellished by the lapidary. The mineralogist and connoisseur of fine stones will not share Dr. Evans' pessimism, because we learn that really good quality stones, according to our standards, are seldom seen in any antique jewelry. This is partly because old pieces have usually been destroyed and remade as fashion changed. It is also partly because so many fine stones that we see today have ancient histories; they have been passed from generation to generation, and our wealth of beautiful stones today actually represents most of man's accumulated treasure through a thousand years of mining. Most of our gem mining, like all our other mining, however, has taken place in the past few centuries.

Dr. Evans' book, in which she sums up much of her earlier studies, will be a standard reference work on jewelry and should prove of value for anyone interested in the life and styles of historical times. We would like to hope, however, that she is unduly pessimistic of the future of jewelry, however, and that taste will develop to support jewelers who provide suitable settings for the far more beautiful stones of today.

F. H. PUGH

JOHN LACEY'S BOOK OF WOOD CARVING

Prentice Hall, \$2.95
108 pp. 38 illus.

IN this book the author successfully opens the door to all would-be wood carvers who are inhibited by fears of expenses and technical difficulties. This he accomplishes by reducing the essential costs to a sharp knife and a block of sugar pine or poplar, and by laying the technical bogies with well-planned directions, noteworthy for their clarity, simplicity, and warm human approach.

The numerous pictures and diagrams, while by no means of the highest artistic order, are thoroughly adequate as supplements to the directions. Though confined, as Mr. Lacey's own carvings evidently are, to natural history subjects, such as fish, ducks, and dogs; the methods they illustrate can be readily applied to other subjects.

Thus, though the book of wood carving is no spellbinder and is of limited appeal, it satisfactorily fulfills the author's modest aims. It also reveals Mr. Lacey as an interesting and friendly personality—well worth knowing.

G. H. CHILDS

CONQUEST OF THE MOON

----- by Wernher von Braun
Fred L. Whipple
Willy Ley

The Viking Press, \$4.50
126 pp.

THE AUTHORS of this book are well known for their previous contributions to the literature of space travel. In 1952, they joined with three others in writing, "Across the Space Frontier," which, as a forerunner of this volume, was also edited by Cornelius Ryan and illustrated by Messrs. Bonestell, Freeman, and Klep. These authors are not dreamers and visionaries, but calculating men of science who fully appreciate the magnitude of the project under discussion.

The material of this book is revised and much expanded from a scientific symposium, which appeared in *Collier's*

magazine under the title "Man on the Moon."

In nine chapters the book covers such subjects as, The Space Station, Building the Moonships, Journey to the Moon, The Lunar Base, The Exploration, The Return, and many other topics relative to such an expedition.

It explains the practicability of first establishing a satellite station that will circle the earth at an altitude of 1075 miles. To this would be ferried the materials for assembling a minimum of three moonships. Two of these, called "passenger ships," would make the return journey. The other, called a "cargo ship," would carry fuel and supplies to the moon and remain there when the expedition returned.

The construction and operation of these moonships are described in considerable detail as are the safeguards against mishap and the navigational problems. Other chapters describe where the expedition might land on the moon, tell how the base would be established and what research would be undertaken.

Many magnificent full-color paintings by Chesley Bonestell help greatly to clarify the text, as do the charts and diagrams by Fred Freeman and Rolf Klep.

It is doubtful that anyone can read this book without capturing some of the enthusiasm of the authors regarding the future possibilities of space travel, although this reviewer remains somewhat skeptical of their prediction that man will reach the moon in "perhaps twenty-five years—certainly by the end of this century."

ROBERT R. COLES

AMAZON TOWN: A STUDY OF MAN IN THE TROPICS

----- by Charles Wagley

The Macmillan Co., \$5.00
305 pp.

TO many of us the Amazon means dense forests, snakes, cannibalistic fish, heat, humidity, insects, and unfriendly Indians. It is seldom realized that the area is inhabited by people like ourselves, who take their surroundings for granted as we do ours. In this book, Dr. Wagley, who lived in a small Amazon town (which he calls "Itá"), not only relates in a simple and readable manner the details of making a living, the houses and material possessions, the religious activities combining Catholic doctrine with Indian beliefs, and the methods of recreation, but also describes the more human characteristics of the people, their hospitality, generosity, pride, sympathy, and sense of humor.

The result is not just a community study. The Amazon is one of the world's largest underdeveloped areas, and if we are to change it, we must know why this

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is so. Wagley believes that it is not the climate or environment but the backward methods of exploitation that are to blame. The solution is not simply to introduce more modern tools and techniques. The analysis of Itá shows that the people are sustained by a large body of tradition, which to us is "silly superstition," but which to them is tried and true and not relinquished readily for something unfamiliar. Furthermore, Itá is part of an economic and social pattern that embraces the whole Amazon, and local improve-

ments cannot be permanent if the area as a whole remains backward.

Dr. Wagley does not consider improvement of the Amazon hopeless, nor does he see the region as the world's bread basket. His conclusion is that specialized techniques can make agriculture practical on the lowland floodplain and that such development, would raise the present standard of living and permit the area to support a larger population. As a balanced appraisal of a fascinating subject, this book is highly recommended.

BETTY J. MEGGERS

well-written explanatory texts, states that the choice of pictures was mainly on pictorial quality. There is no attempt at planned, comprehensive coverage for any single trip, area, or subject, but there is a theme—perhaps just reality and beauty—which makes an unusually successful record of country and people.

We meet Chipewyan Indians at the northern edge of Manitoba, where forest and tundra blend together, and Eskimos due east across Hudson Bay in a treeless arctic setting; and we travel with other Eskimos in the Coppermine-Bathurst area. Summer scenes from southwestern Ontario and northern British Columbia balance off the series. Anyone who likes wild country, Eskimos, and Indians will appreciate what Mr. Harrington has given us.

JUNRUS B. BIRD

HISTORICAL ASPECTS OF ORGANIC EVOLUTION

----- by Philip C. Fothergill

Philosophical Library
\$6.00, 427 pp.

THIS history of evolutionary theories is distinctly biased and does not adequately reflect the present consensus, but it is an interesting essay that may be especially illuminating to students of evolution who are more orthodox in science and less orthodox in religion than is the author.

—C. G. S.

THE WATCHER AND THE RED DEER

----- By Richard Perry

The British Book Centre, \$2.75
188 pp.

IN this most interesting little book, Richard Perry, an excellent observer and a writer of charm, tells in simple language the story of the red deer of the Scottish Highlands. Mr. Perry had excellent opportunities to observe the many herds of deer, for his home was in the foothills and he was able to make daily trips into the higher mountains where the deer ranged. The story portrays the seasonal changes in the habits of the deer; the rut, the inclemencies of winter, the calving season, and the deer's movements into the various altitudes, dependent on weather and the food supply.

The "Watcher," as Mr. Perry calls himself, gives the reader an almost personal insight into the lives and habits of the red deer, and at the conclusion of the book this reader had the feeling that he knew the red deer with an intimacy that he had never hoped to attain.

In recent years it has seemed to be the trend of British authors to write interesting and authentic life histories of their local mammals in a style that appeals to the public. Let us hope that capable American authors will do likewise.

T. DONALD CARTER

THEY CAME TO THE HILLS

----- by Claire Eliane Engel

The Macmillan Company, \$4.75
275 pp., 17 illus.

MANY authors have written at length on mountains and on their experiences in climbing precipitous heights. Claire Eliane Engel in *They Came to the Hills* has attempted to bring out some of the reasons why men and women at different times and in different places have indulged in the pastime of mountaineering—what it is that urges them to go on and on in their quest to conquer some perilous peak.

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Some unconsciously loved the mountains; others sought the mountains first and loved them afterwards. Still others sought the mountains to escape—perhaps from themselves—or as a means of overcoming an inferiority complex. Ruskin, on the other hand, was violently hostile to mountaineers though he loved the mountains for themselves.

The book is fascinating and entertaining and well worth anyone's time to read.

G. G. GOODWIN

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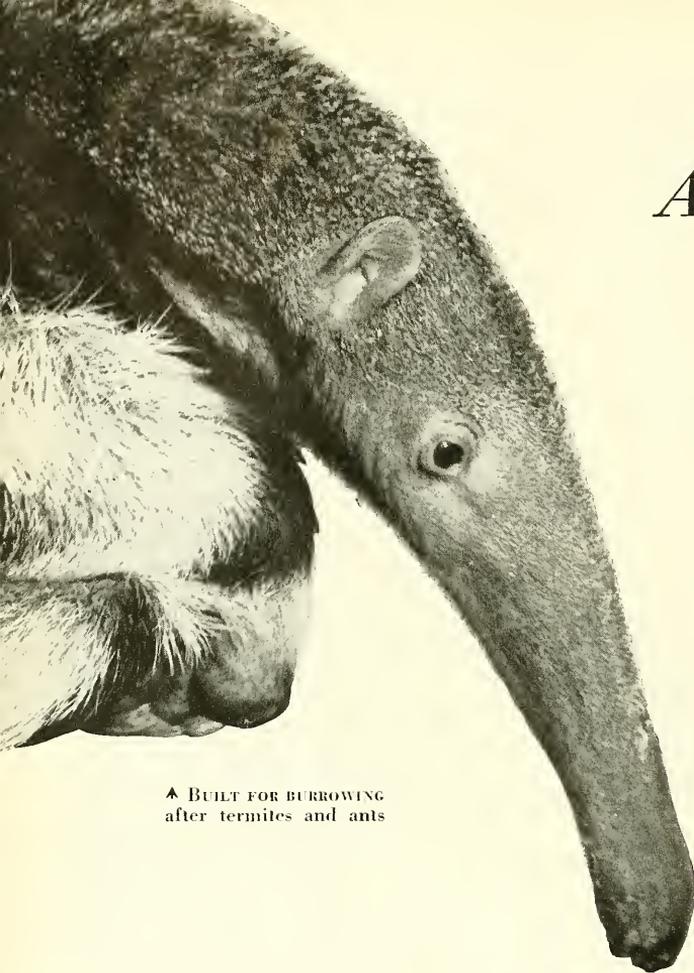
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▲ BUILT FOR BURROWING
after termites and ants

An Anteater named **TEDDY**

Even as a pet,
his single interest
was in ants,
and he never
quite got used to
a tame chimpanzee

By

LULO HESS

All photographs by the author

IN March, 1953, when I visited the Sportsman's Show in New York City, I had to wait in a queue for my turn to see into a cage labeled "Anteater, Brazil." I was about to go away without seeing him. After all, one anteater looks much like another, I said, but the smallness of the cage puzzled me. I couldn't imagine how an anteater could fit into such tight quarters.

When I finally got near the animal, I was not sorry I had waited. It was the first time I had seen a baby anteater. He was four months old and about three feet long from the tip of his nose to the end of his bushy tail. He was tame, and the owner, Mr. C. Chase of the Chase

Wild Animal Farm, took him out for me to hold.

He weighed about eleven or twelve pounds, and I recalled that my fifteen-months-old chimpanzee was a little heavier. Visions of an anteater playing with a baby chimp rose before me. The sale was completed twenty minutes later.

The anteater was to stay at the animal farm, near Boston, until the first of May so that I could take him directly out to the country instead of keeping him in the New York apartment. He was to be shipped to me in New York by air.

I picked him up at La Guardia Airport and went straight out to Pennsylvania. All the way, I could

hardly contain my desire to see him. My main concern was whether he had grown too big to be handled. The crate was small enough, but all I could see through the cracks was a bristly ball of fur. I had arranged an inside cage for him on my porch and a large pen for him outdoors. I hoped it would be warm enough for him to spend the day outside, but at night I intended to bring him in, until the weather was warmer and more settled.

When the crate was opened, the anteater walked out very slowly and cautiously. I was happy to see that he had not grown too much. The little chimp watched everything with fascination and then



◀ PHOTOGRAPHY UNDER DIFFICULTIES. Christine, the chimpanzee, didn't help the author take the anteater's portrait as he looked cautiously out of the box in which he arrived from Boston

▼ TEDDY went to investigate the newly acquired lamb and licked it with his long tongue



jumped right into the cage, eager to pet the new toy. But this nice little teddy bear hit back. The chimp ducked just in time. I was astonished at how quickly the anteater could strike with his huge claws.

In the months that I had waited to get him, I had gathered as much information about anteaters as I could. It was disappointing how little there was. All the writers gave a description of this "fossil animal" and its habitat—the damp forests of tropical America. They told briefly of its small toothless mouth and long tongue. About half the references claimed that the tongue was sticky; the other half



▲ THE ANTEATER learned to know an orange when he saw one, for he relished orange juice greatly

AN ANTEATER NAMED TEDDY



▲ "LET'S JUST SEE whether there are some ants down here"

stated the opposite. After touching the anteater's tongue many times, it seems to me that the tongue itself is not sticky but the saliva is. He would run his tongue with great speed back and forth over my hand, and there was an adhesive coating on it afterward.

In the accounts there was also mention of the coarse hair and the big claws. The latter could be dangerous if the animal were in a rage. They curve backward and are exceedingly efficient tools for digging in the termite hills of their South American homeland. Most writers stated that anteaters live exclusively on termites, but some claimed that they also eat a certain kind of ant. All agreed that they wouldn't touch our local ants, but my anteater ate large quantities of them!

The bushy tail covers the animal

when asleep, but the natives of South America believe that it serves also to sweep ants off the ground in the woods. The tail is very flat.

An anteater has only one baby at a time. That was about all I could find out about anteaters, except that they can be kept fairly well in captivity on a diet of eggs and milk. They were said to be dull-witted, slow-moving animals.

Well, there was nothing slow-moving about the way my anteater struck at the little chimp. When I tried to touch him, he lifted his foreleg to strike at me, too. So, after giving him some food, I retreated with the chimp to let him settle down and get used to his new surroundings and to us.

I had put a box on its side in his cage and filled it with hay to serve

as a sleeping place. The first thing he did was to sweep out all the hay with his claws. After he was well rid of his bedding, he curled up in the box for a long sleep. He slept all the rest of the first day, and the night. The next morning he was much more at ease and came out to eat his food and let me pet him. His front leg would rise ready to strike, but it remained only a gesture. He never quite lost this habit, even though he never really struck. It was like a reflex action.

We named our anteater Teddy. He adjusted very rapidly. I had put a collar around his middle, which he kept on always and did not mind at all. When the weather was nice, he moved outside. He liked best to be tied to a tree in the grass. There he could search for ants all

day long—a search that was his whole life. He never stopped. He preferred the tiny black ants to the red ones, and he especially went for the eggs and larvae. There is a big anthill not far from the house; and when he was put near it, he got very excited. He ripped a hole in it with his claws and stuck his nose into it. He ate some, but after a little while he turned away, without opening the hill all the way. Those were red ants and did not suit him too well.

He did better with the nests of the small black ants he found under rocks and in the grass. With amazing accuracy he could detect those nests; he must have smelled them. When he found such a nest, his nose would twitch, and he would

make a snorting noise and get very excited. He could turn over big, heavy rocks. He would run his long tongue inside the tunnels, and one could not see how many he ate. But sometimes he would push a rock away and find a nest that was well exposed, and I could see that he picked out the larvae and eggs first and then concentrated on the ants. He was only interested in ant colonies and never attacked scattered ones. Since many ants ran away when he disturbed their nest, he never consumed an entire colony.

He ate quite a bit of soil in his quest for ants. One day he found a nest under some pine trees, where the floor was thick with fallen needles. As he ran his tongue in and

out of the tunnels, he picked up a lot of needles. They stuck to his tongue and nose and disappeared into his mouth. He was none the worse for this.

The kind of terrain he was on seemed of no importance to him. He walked on hills, over rocks, and on logs without looking up. When he came to water, he seemed not to notice the change. He kept his nose to the ground so he would not miss any ants and walked along the banks of the pond or waded right into the water. If he wanted to go to the other side, he just swam across, and while half-in and half-out of the water, he would stop to pick up some ants at the very edge. He never shook the water out of his coarse hair. It was as if he didn't



▲ TEDDY was a slow feeder, but Christine the chimp always enjoyed watching the process



➤ THE ANTEATER took to the water readily



▲ THE ANTEATER rips the anthill open with its powerful claws and then removes the ants with its long tongue

know the difference between water and land, except that there were no ants in the water. He could climb trees very well but seldom did.

The chimpanzee and the anteater never became close friends as I had hoped. The little ape never went really close to the anteater except when there was wire between them. Teddy never trusted the chimp and would either back away or get ready to strike. Her movements were too quick for him and she seemed to make him nervous and upset. She was very rough in her play, and when he was not looking she might quickly pull his tail. Though he loved to be petted and have his head scratched, he was sensitive about his tail. He never permitted me to touch it. Whenever I scratched his head, he would stand very still and close his eyes.

The little chimp consented to only one thing: she let Teddy pull her around in a little wagon. But she soon got impatient, since he stopped all the time to look for ants. When he sometimes turned to sniff her, she would jump away as fast as she could. He did not care if he was harnessed to the little wagon or not.

He was completely unconcerned about everything around him. He did take a mild interest in the lamb. Whenever their paths crossed, he would stop and lick it. He liked to lick things—hands, shoes, the chimp's feet (she only let him do this if he was in the cage). He licked the broom and the chairs and even the cat. He was very much interested in the kitchen. He might have smelled ants, for I had had an invasion of them when I first opened the house in the spring. But they soon departed, and I think that he hardly ever found any. However, he kept on looking.

There were no signs of great intelligence, but he was not stupid. I didn't try to teach him anything and don't know if it would be possible to do so, but he learned to fit himself into our household in a very short time. He knew my voice and responded to his name. He knew that when I changed the little

chimp's diapers on the table next to his cage, he could lick her feet without her objecting. He had to climb on top of his sleeping box to do this, which was not easy for him since the box was smooth; but he invariably managed it. When he saw me fold a newspaper, he would get very excited, expecting to be fed, because a newspaper was always spread under his bowl of food. He also recognized his food dish. When I came in the morning to put his leash on, he would be as docile as a lamb. He would come toward me and stand very still so

➤ TEDDY LEARNED to go up and down stairs

▼ THEY WERE WILLING on occasion to eat at the same table





I could fasten it. But in the evening it was a different story. He knew I had come to take him away from his ants, and he would rebel as best he could. In the cage he would rear up, threatening me with his claws and squeezing himself into the farthest corner. When tied to a tree, he would give me a merry chase around the tree until his leash got tangled; then he would pretend to fight. He never really struck out at me though, and I would tuck him under my arm and carry him in. Eventually he learned that the fight accomplished nothing, and he gave up trying.

But I always carried him in and out of his cage, since it would require up to twenty minutes to walk him about a hundred feet. Every other step he would stop to look and dig for ants. He was very strong, and I could not pull him against his will. He also learned to recognize an orange and would get very excited when he saw one.

◀ HE COULD CLIMB TREES well but seldom tried

▼ TEDDY could control his claws like fingers and could grasp things tightly with them



▼ THE ANTEATER'S hind foot is quite different from his front one



He got the juice of half an orange every other day after I found out how much he liked it. He also was fond of applesauce and grape juice and got those as a treat from time to time.

An anteater is not the most desirable pet for a home. Though Teddy appreciated a soft couch to some extent and learned to walk up and down stairs and drink from a cup at table, he never stopped looking for ants, and would dig for them in the pillows or rugs. Teddy was not housebroken, either, though I think he could have been trained to go to a box. He kept himself fairly clean by combing his fur with his long claws. The claws could be controlled like fingers, and he could grasp things tightly with them. He washed himself with his tongue, and his coat never felt sticky afterward. His tail received the most attention, probably because he could reach it best. The tongue was black but became pink at the base.

Most anteaters are nocturnal, but Teddy became so adjusted to the life of my house that he was awake from eleven A.M. to seven P.M. At seven he would curl up in his box, fold his tail over his head, and remain "dead to the world" until the next morning. I could almost set my clock by his habits. When I heard him snorting and pushing his empty bowl around in the morning, I would know it was eleven o'clock and that Teddy wanted to be fed.

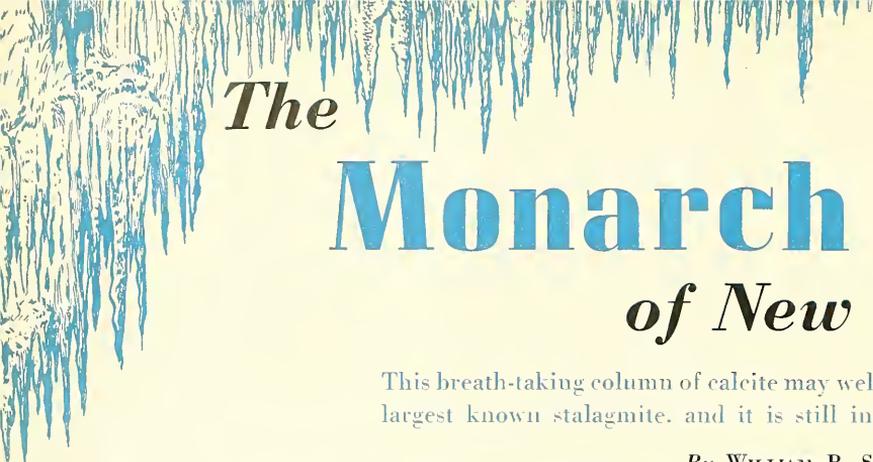
It took him almost a half to three-quarters of an hour to finish his food. He got eight ounces of milk, two eggs, and some chopped beef and cereal twice daily. He usually lay down while eating and closed his eyes. Nothing would disturb him when he fed. The chimp would bang on the wire of his cage and poke her fingers in his

food. When she could not reach it, she would shake the cage in anger, but Teddy went on eating. When he had finished he would walk up and down impatiently, eager to go outside so he could eat some ants.

Only once did I hear him make any other noise than the snorting and grunting sound and that was when he got tired of being photographed and pushed around for "just one more picture." He turned on me and gave a hissing snarl, almost like a tiger or lion. Otherwise he was very mute, and I don't know whether he had many other sounds. He was a very stubborn animal, always ready to protect himself with his only weapon, his claws. His movements were swift, almost graceful. He had but one thought in his head—ants. Though he made friends with man, he was not domesticated.

▼ CHRISTINE would let Teddy pull her around in the little wagon, but she soon grew impatient, for he stopped all the time to look for ants





The

Monarch

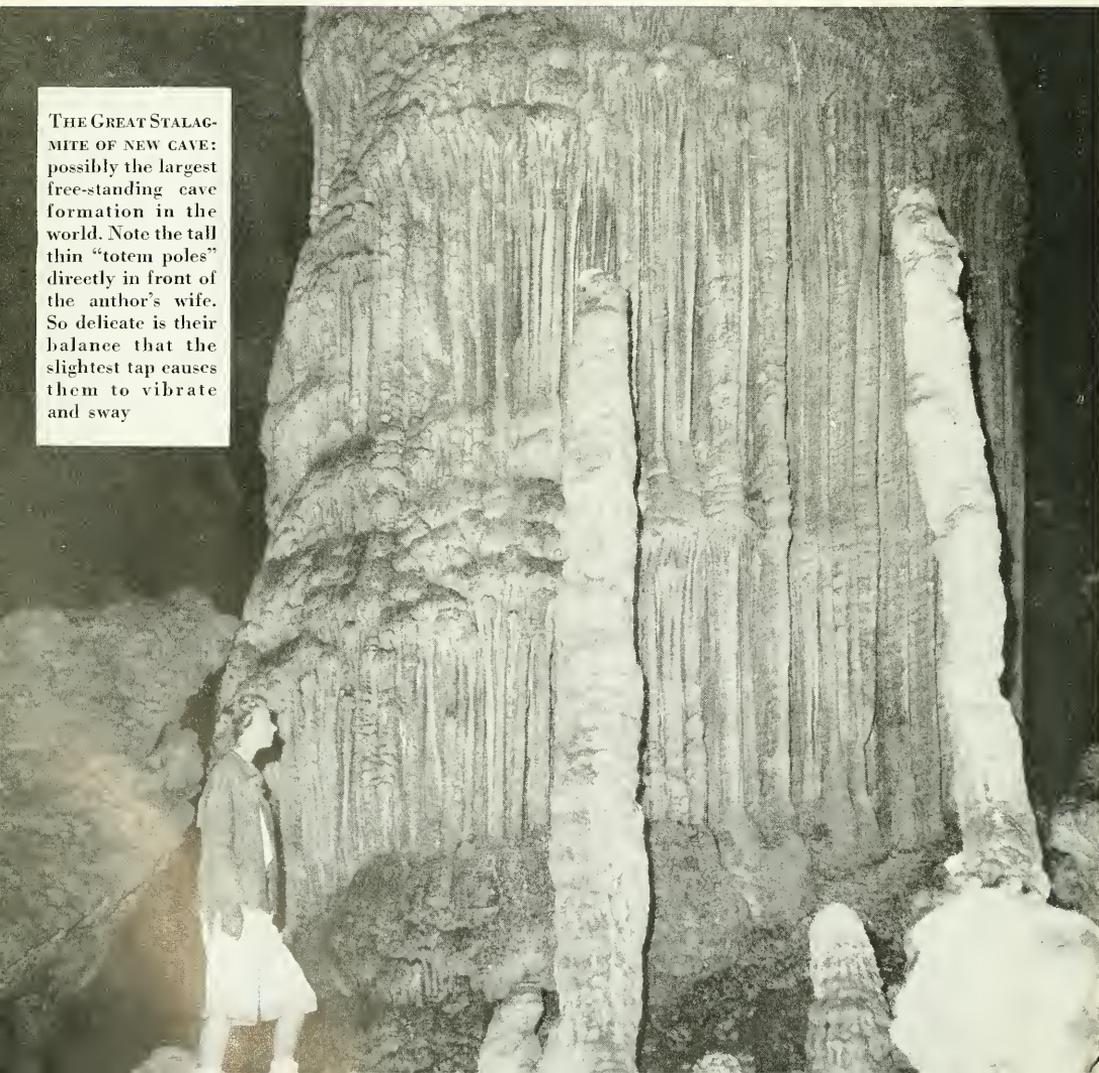
of New Cave

This breath-taking column of calcite may well be the world's largest known stalagmite, and it is still in active growth

By **WILLIAM B. SANBORN**

*Supervisor of Visual Education,
San Francisco Unified School District*

THE GREAT STALAGMITE OF NEW CAVE: possibly the largest free-standing cave formation in the world. Note the tall thin "totem poles" directly in front of the author's wife. So delicate is their balance that the slightest tap causes them to vibrate and sway



THE carbide lamps hissed and ignited with a soft popping sound, as we turned with expectation into the cool, inky blackness of the opening. At last we were descending into New Cave and would be able to judge for ourselves the stories about its great stalagmite. If you discuss caves with National Park Service personnel in the Southwest, someone usually mentions "the big stalagmite in New Cave." Some believe that it is larger than the famous Giant Dome in Carlsbad, which would make it the largest known.

It was while doing some research in the Parks and Monuments of the West that my wife and I found ourselves climbing the steep mountain-side to New Cave, accompanied by Ben Gale, Chief Geologist for the Service. Few realize that the Carlsbad Caverns National Park encompasses a large area in excess of the famous cave that gives the Park its name. In the rugged canyon back country of the Park are a number of known cavern openings. New Cave is one of them.

This cave was presumably discovered about the same time as Carlsbad in the 1880's. There have never been regular guided trips to New Cave, or Slaughter Cave as it is also known. Comparatively few people have visited it, although limited guano mining operations have been conducted near the entrance. A huge iron gate prevents the public from entering without special permission or guidance.

Having just left a midsummer temperature, the cold breeze of the cave was welcomed. The passage sloped downward into the mountain at a steep angle for about 200 feet, then greatly enlarged and leveled out into a labyrinth of huge chambers and grottoes. As we worked our way into the caverns, our lamps probed the silent darkness like inquisitive fireflies.

Actually New Cave is not extensive and goes back into the mountain for only a few hundred yards; however, the size of many of its rooms and the extraordinary beauty of their decorative formations make

the cave notable. Were New Cave not so close to famous Carlsbad, it surely would receive top billing.

The most spectacular and colorful section is at the end of the cavern, concentrated along the back wall and its many alcoves. Here is a lofty vaulted room estimated to be 100 feet high, 200 feet wide, and perhaps 300 feet long—rather hook-shaped, with several spacious alcove chambers.

This great hall houses many spectacular stalagmites, several massive ones reaching over 20 feet in height. Some are capped by a glistening frosting of gypsum crystals, giving them the appearance of enormous marshmallow sundaes. The walls are stained in pastel shades of yellow, orange, cream, blue, and brown, and the arched ceiling is festooned with stalactite draperies. In the alcoves are located other formations, such as The Tear, and The Clansman—a large stalagmite that resembles a ghostly hooded and leering face.* When our lamps played on this feature, it gave my wife and me a well-registered start—much to the amusement of Ben.

The lamplight caused many formations to shimmer—the coating of gypsum crystals reflecting the light like millions of tiny mirrors. One mammoth stalagmite, The Christmas Tree, is indeed well-named. Not only does it resemble a tree; it is complete with "new-fallen snow."

Here amid the bizarre fantasy of New Cave stands the most breathtaking stalagmite we have ever seen.

This stalagmite, which is unofficially nicknamed The Monarch, is almost beyond description. It is entirely free-standing, in active growth, and rises like a gigantic pillar from the cavern floor. No accurate measurements have been taken; however, its base has a diameter of close to 15 feet, and it is probably well over 65 feet high. For the sake of description, there is only one thing with which to compare it—the bole and main trunk of a redwood tree.

*See NATURAL HISTORY, May, 1938: "Exploring a New Cave," by R. M. F. Burnett.



▲ THE TEAR, another impressive formation in New Cave, New Mexico

Reportedly the largest known stalagmite is the 60-foot Giant Dome in the Big Room of Carlsbad Caverns. Having viewed the Giant Dome many times, all I can say is that the stalagmite of New Cave has all the appearance of a larger feature. The formation is huge, yet maintains an impressive symmetry and balance throughout, and its sides are fluted with delicate calcite draperies. So great is the stalagmite's size that with our limited lighting equipment we considered ourselves lucky to obtain pictures.

Clustered near the base of the stalagmite are several tall "totem pole" stalagmites. One reason why the public may never be allowed in this cave is the fact that it takes only the *slightest tap* on one of the "totem poles" to start it vibrating and swaying. So delicate is their balance that a moderate blow would surely topple them, even though they weigh hundreds of pounds.

We were reluctant to leave the great hall but anxious to be out of the canyon before dark. As our truck rumbled into the desert, we discussed the afternoon's explorations, and our thoughts lingered on that great stalagmite, standing erect in the heart of the Guadalupe Mountains, shrouded in total darkness, disturbed only by the constant dripping of water and the infrequent, probing lamps of the naturalist.

Is the great stalagmite of New Cave the largest-known in the world? Measurement alone can tell.

◀ IT WAS A *STEMONITIS* that was exhibited at the Chicago World's Fair in the "Believe It or Not" pavilion as "Hair Growing on Wood." This is *Stemonitis axifera*, which forms beautiful clusters of leathery, cinnamon-brown sporangia supported by slender stalks. The fruiting bodies may be nearly an inch high



Plant or Animal?

The beautiful slime molds, at the border line of the two kingdoms, are everywhere, but few people know them

By CONSTANTINE J. ALEXOPOULOS

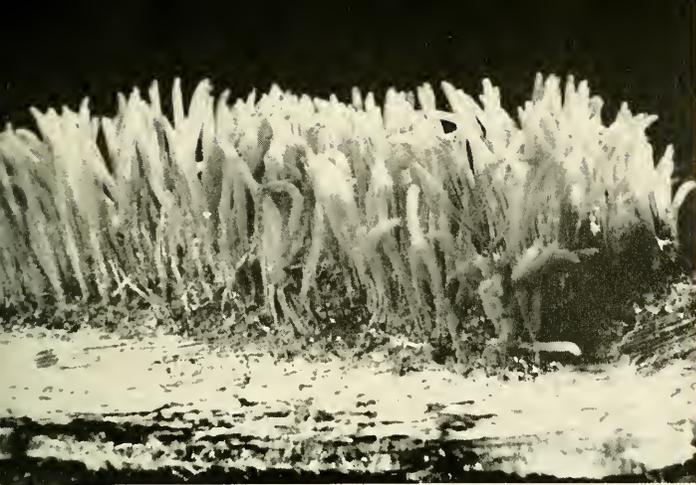
With photographs by Philip G. Coleman

HAVE you ever looked at an old log in the forest? Really examined it at close range? On your knees? If you haven't, you may have a surprise coming. Some bright sunny day in the middle of June (earlier if you live in the South), two or three days after a heavy rain, go adventure hunting to the nearest log in the neighboring woods. Even if you have 20/20 vision, take a good reading glass along. If you own a hand lens, hang that around your neck, too. What you will find may be very small.

How do you begin? Just walk to the first wet log you see, kneel beside it, and start looking. No luck? Try another log, a fallen tree branch, a moist stick, or some moist dead leaves. And there it is—a naked, slimy, shapeless mass, which in a matter of hours will change into a hundred exquisitely shaped jewels! You will see a beautiful lacy network of bright yellow jelly today, a mass of tiny perfect, shiny balls tomorrow. It is naked as an animal at one stage, and is clothed in a wall at another, with all the colors of the rainbow playing upon

it. It creeps like a snail this afternoon and will be anchored down like a miniature flower by morning. What is this thing, this contradiction of nature? Is it a plant or an animal? Actually, some say it is neither. It's a slime mold—so help me!

You are more likely to find the fruiting stage of a slime mold than its creeping, jelly-like stage, because a slime mold comes to the surface to fruit. So let us concentrate on the fruiting bodies to begin with; they represent the plantlike phase of the organism.



◀ LARGE CLUSTERS of dark purplish-brown sporangia are formed by *Stemonitis splendens* on decaying wood. They reach a height of one inch

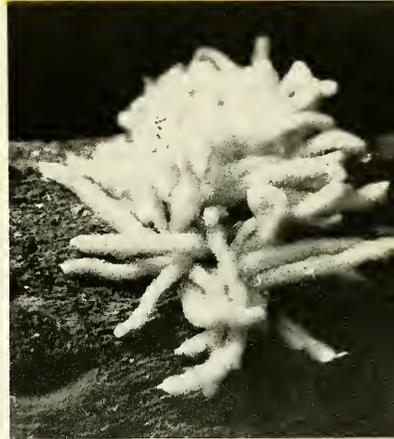
▼ ONE of the most spectacular of the common slime molds is *Arcyria nutans*. The yellow capillitial net from each sporangium expands tremendously and droops over at maturity. The cluster pictured here is one-half inch in diameter

Bright red or orange, chalky white or iridescent purple, silvery or golden yellow, brown or even black—their color depends on the species you stumble on. And that is entirely a matter of chance. You may see tiny spheres or ovals with or without a slender stalk; or oval discs on nodding stalks; or pear-shaped bodies, pointed-end-down; or long, branching miniature tubes forming a network; or tiny doughnut-shaped bodies; or masses of slender, feathery bodies; or minute cups, each supporting a springy mass of delicate threads.

You are likely to find any of these colors and shapes, and many more; and the fruiting bodies will always—well, almost always—be infinitesimally small, so small that the average stroller passes them by and never sees them. He has done this for thousands of years and, consequently, has never named them. None of these miniature beauties have poetic names like Spring Beauty, Lady's-slipper, or Buttercup. Their only names are the Greek and Latin binomials that the scientist has given them—very descriptive names but strange and hard to pronounce until you become acquainted with them and begin to associate them with the particular species to which they are attached. *Stemonitis*, *Hemitrichia*, *Arcyria*, and *Ceratiomyxa* then become as familiar as the common names of wild flowers and just as easy to say.

Now, what about the naked stage—that slimy, jelly-like stage that gives the slime mold its name? This, too, is not difficult to find if you know where to look for it. In the growing stage, a slime mold hides in moist, dark places. You are likely to find it under a log, creeping imperceptibly between the bark and the wood, or inside the wood of a moist, well-rotted log. You may also find the *plasmodium*—for that is what the scientist calls the jelly-like stage of the slime mold—under dead, moist leaves on the floor of the forest, or even in the compost heap in your back yard. This is the animal-like stage, in which the slime mold creeps and feeds like a giant amoeba, taking in solid food like any other animal. Its food consists of bacteria, protozoa, fungus spores, or bits of dead leaves and other organic matter lying in its path. It takes them into its jelly-like body, digests them, and moves on, leaving its wastes behind.

Such a plasmodium is a fascinating thing to watch. Strip a piece of bark from an old wet log and look on the underside. If you see a bright yellow network of delicate, jelly-like threads, break off a piece of the bark bearing a portion of the plasmodium and put it in a Mason jar. When you get home, cut a piece of absorbent paper, such as paper toweling, to fit the bottom of the jar. Wet it thoroughly and pour off all the water that has not



been absorbed (slime molds are not aquatic). Then put the bark with the plasmodium on the paper and loosely replace the lid on the jar.

Keep the jar away from direct light and observe it from day to day. It is a show worth watching. Feed the plasmodium every few days by sprinkling on it a few grains of rolled oats just as they come from the box. Once in a while add a little water to keep the paper moist. With a little luck (not all plasmodia will grow well in captivity), in a week or so you will have more plasmodium than you know what to do with. If you were lucky enough to collect a good species, the plasmodium will be all over the paper and the sides of the jar within a week, fanning out in all directions.

You may also have much bacterial and fungus growth, and a foul smell that will nauseate you if you open the jar. When such things come to pass, scrape off with a matchstick some of the plasmodium from the sides of the jar and start all over again with a clean jar, a clean piece of paper, and the bit of plasmodium you saved. Put in a grain or two of rolled oats, and you are in business again.

When you tire of growing the plasmodium, don't throw it away. Stop feeding and watering it and bring the jar out into direct light. Some day soon you will go to the jar and find no plasmodium at all. Instead, you will see masses of tiny fruiting bodies. They have formed on the paper, on the sides of the jar, and very probably on the underside of the lid. This transformation from plasmodium to fruiting bodies takes only a few hours and is one of the most re-

markable changes you can observe anywhere in nature.

A plasmodium is not a very complicated structure as living things go. It is just about the purest form of protoplasm that one can expect to find, and it appears to be without form or structure. How a relatively simple mass of jelly can organize itself into intricately shaped and sculptured fruiting bodies within a few hours is one of the many wonders of nature.

When the fruiting bodies are completely mature, usually the day after they first appear, rub a few of them between your fingers. You will find that they break very easily and release a powdery purplish or yellow dust, the color depending on the species you have. This dust consists of the microscopic spores of the organism which, in nature, are dispersed by the wind and start the life cycle over again.

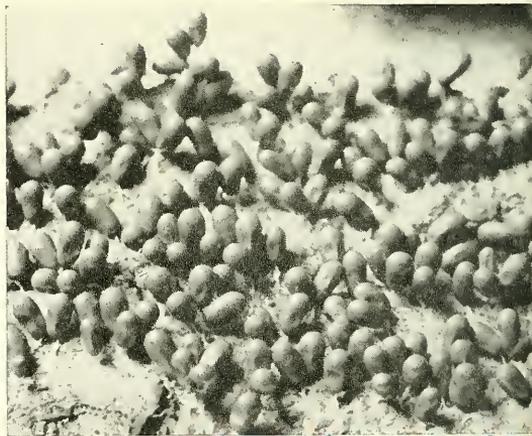
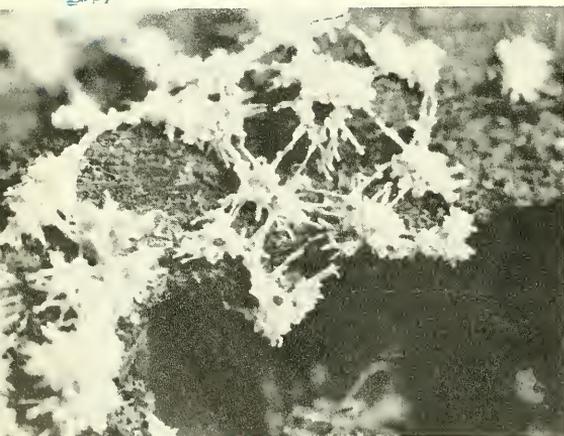
You have now seen as much of

the life cycle of a slime mold as you can possibly observe without a microscope. The jelly-like stage changes into fruiting bodies which bear the spores. The spores germinate, and eventually a plasmodium is formed. What happens in the interval between the germination of the spores and the formation of the plasmodium requires a microscope to explain. Let us follow the life cycle of one of these plant-animals (fungus-animals some scientists call them). The fruiting body is as good a place as any at which to begin.

The fruiting stage of a slime mold may consist of a large number of small bodies (*sporangia*) massed together on a transparent, cellophane-like base. All of them have developed from a single plasmodium. Each body is surrounded by a wall (*peridium*) of one or two layers. The outer layer is often covered with lime. The wall breaks

▼ PURE WHITE CLUSTERS of fruiting bodies are exhibited on wet logs or sticks by the abundant and widely distributed *Ceratiomyxa fruticulosa*

▼ UPHOLDING THE REPUTATION of the slime molds for variety, *Leocarpus fragilis* produces glossy brown sporangia almost an eighth of an inch long. It is rather common in the Northern Hemisphere and easily recognized. It often occurs in wide belts on the bark of fallen or living trees



TRY IT YOURSELF

With only a Mason jar, a piece of absorbent paper, and some rolled oats, you can "capture" these curious organisms in their animal-like stage and watch them grow. Keep the paper moist but not wet and feed the plasmodium every few days. In a week or so, you may have more plasmodium than you know what to do with. Like a giant amoeba, the organism will take solid food into its jelly-like body and creep from place to place.



at maturity and reveals the interior of the sporangium, which generally consists of thousands of spores, often intermingled with a network of threads, the *capillitium*. In many species the capillitium is elastic and expands in a springlike fashion, bringing the spores up high above the fruiting body where they can be scattered easily by the wind.

In some species, instead of a group of sporangia, the fruiting stage consists of one massive fruiting body (*aethalium*), which may be sev-

eral inches in diameter. In still other species the plasmodium, just before fruiting, masses itself around the main veins of its network, covers itself with a wall, and becomes converted into a network of tubes. We call such a fruiting body a *plasmodiocarp*, because it more or less retains the general aspect of a plasmodium. Forms intermediate between these three main types of fruiting bodies also occur.

Each species, of course, forms its own type of fruiting body, by

which it can be recognized. The type of capillitium and the size, color, and sculpturing of the spores are other characteristics useful in identifying species.

The spores of the slime molds are microscopic. They vary in color from colorless through yellow, rosy, lilac, and purple to brown. They also vary in the thickness and the ornamentation of their walls. It seems that slime mold spores can live almost indefinitely waiting for temperature and moisture conditions that will induce germination. Spores have been successfully germinated after 54 years of storage in a herbarium—a very dry environment if there ever was one. Once thoroughly wet, however, it does not take long for the spore coat to crack open. The spores of some species will germinate within 20 minutes after they have been placed in water. Spores of most species germinate 24 to 48 hours after soaking, but those of a few species require as long as 7 days, at least under laboratory conditions.

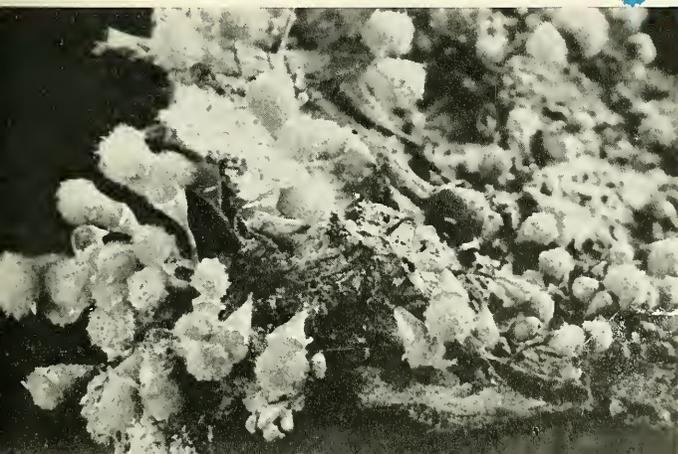
When the wall cracks open, a naked, pear-shaped "swarm cell" creeps out from the germinated spore. Swarm cells at first remain quiet, as though the effort of being born has tired them out; but soon they put out two whiplike hairs (*flagella*) and start swimming. The peculiar rotary movements of a swarm cell are fascinating to watch under the microscope. Quite often the naked cell will sit on its rounded lower end, extend its neck, and begin rotating. (I always think of a trained seal when I watch a swarm cell go through such contortions.) At other times the cell will swim around aimlessly. These movements may last a few minutes or several hours. Sometime during this interval a swarm cell finds a compatible mate and the two unite, fusing completely into a single cell. This double cell (*zygote*) soon loses its flagella and begins its creeping movement. It is now in the first stage of becoming a plasmodium.

The zygote feeds and grows, feeds and grows. If it meets with



SMALL CLUSTERS of quarter-inch fruiting bodies, mouse-gray in color, distinguish *Lycogala epidendrum*. The plasmodial stage is a beautiful al-colored ball

YOU WILL easily find this one, *Hemitrichia clavata*. Next to *Ceratiomyxa tuculosa*, it is perhaps the most common slime mold in the temperate zone. You will recognize it by its yellow, cuplike, stalked sporangia. When mature, they break and expose a ball of yellow, springy capillitial threads. The height of the fruiting bodies is one to two millimeters



other zygotes like itself, a merger takes place. Several zygotes may flow together and coalesce. They add their respective volumes together and form a plasmodium. This merging process may continue for some time, a plasmodium taking in other plasmodia or zygotes and adding them to its volume. Since there are no walls, the union of these structures is a relatively simple process. But if a plasmodium, or a zygote for that matter, comes in contact with a swarm cell, it engulfs it and uses it as food. As we have already seen, the plasmodium feeds on bacteria, various spores, and even swarm cells of slime molds, including those of its own species. When a plasmodium is formed, it creeps away from the light, seeking a dark, moist environment. It oozes under the bark of a log or even penetrates into the soft, rotting wood. There it lives and grows until it is ready to fruit.

What causes a plasmodium to fruit no one is ready to state with any degree of certainty. We know, for example, that pigmented plasmodia, especially those that are yellow, will not fruit unless exposed to light. Type and amount of food and variation in moisture are also related to fruiting. It is probable that exhaustion of food and the advent of dry conditions throw a plasmodium into a fruiting mood, but much research needs to be done be-

fore we can be sure of what happens. At any rate, it is fairly well established that when the plasmodium gets ready to fruit, it crawls to the surface of the log in which it has been hiding, and in a matter of hours changes into the particular type of fruiting body characteristic of the species. Many species will also fruit on dead leaves, on small sticks, on the soil, or on the surface of mosses or other living plants on which the plasmodium crawls.

There you have it. Half animal, half plant, at the border line of the two kingdoms. The slime molds live wherever they find enough moisture and warmth to enable their spores to germinate and their swarm cells to swim. They constitute the best argument for those of us who think that the classification of all living things as plants or animals is an entirely artificial one.

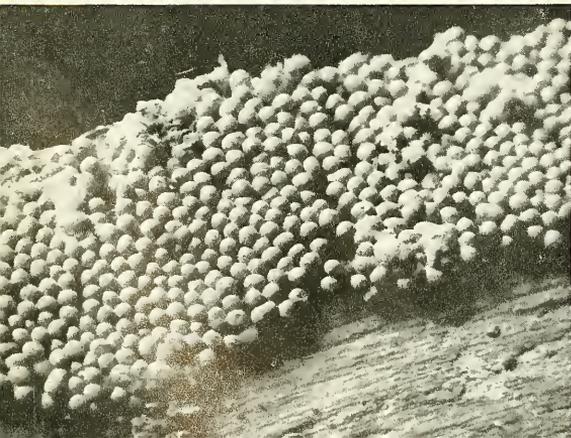
There are over 400 species of slime molds known the world over. A good many of them are cosmopolitan in their distribution, but a few species seem to be confined to the temperate zones or are only rarely found in the tropics, whereas others are more abundant in the tropics, if not strictly confined there. As with other living organisms, however, the known distribution of slime molds often coincides with the geographical distribution of the biologists who hunt them! If

you look for them long enough, the chances are good that you will find many of the 400 species, no matter where you happen to be. Slime molds should be abundant during the moist season in any woods in which logs or stumps have remained on the ground long enough for decay to have set in, or in which there is a good covering of leaf mold. Now, suppose you are sufficiently interested in these organisms to go out looking for them. How would you be able to identify them? Because of their smallness, this is a little more difficult than it is with wild flowers. For positive identification of most slime molds you will need a microscope, but there are a number of common species you can learn to recognize with certainty at a glance, even without a lens.

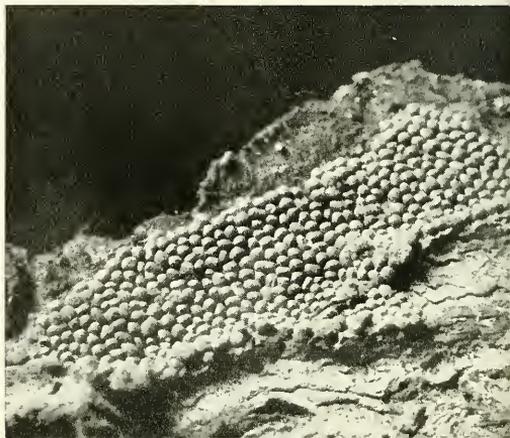
One of the most common slime molds you will find early in the season in almost any forest is *Ceratiomyxa fruticulosa*. This species forms large masses of pure white, many-branched, more or less coral-shaped fruiting bodies on wet logs or sticks. They are so conspicuous that once you learn to recognize them you will spot them several feet away.

Another common slime mold is *Stemonitis axifera* or, indeed, any one of three or four other species of *Stemonitis*, which are just as common. *Stemonitis* has the ap-

▼ AMONG the several species of *Trichia* with bright yellow sporangia supported on very short stalks is *T. favoginea*. Its individual sporangia are only 0.6 millimeters in diameter and about 1.5 millimeters tall



▼ *TRICHIA PERSIMILIS* is another common slime mold. It has tiny yellow sporangia about 0.5 millimeters in diameter. Sporangial clusters, however, may cover an area of several square inches



pearance of a tuft of cinnamon-brown or dark brown hair growing on wood. In fact, *Stemonitis* had the distinction of being publicly exhibited in 1933 at the Chicago World's Fair in the "Believe It or Not" pavillion, over the caption: "Hair growing on wood—Believe It or Not!" Needless to say, slime mold hunters did *not*.

Other very common species that are almost unmistakable are *Arcyria cinerea*, which produces masses of ash-gray sporangia; *Arcyria denudata*, with its groups of red sporangia; *Lycogala epidendrum*, with its coral-colored plasmodia and mouse-gray, cushion-shaped aethalia; and *Fuligo septica*, with its massive, lime-encrusted aethalia.

Before you start out on a slime mold hunt, go through your attic and find a copy of the April, 1926, issue of the *National Geographic*

Magazine. Look through Mr. Crowder's article on "Marvels of Mycetozoa" and study the beautiful paintings of some of the most common species of slime molds that illustrate the article.

And now we'll pretend that you cannot sleep another night without starting a collection of the slime molds in your vicinity. How can you collect and preserve them? It is all very simple. You will need a sharp hunting knife or an ordinary pocketknife, and a market basket or something else equally cheap and handy for carrying the specimens. Or, if you are one of those people who must have an "outfit" to start out on a new venture, you can assemble one without too much trouble. If you buy an ordinary metal picnic basket, about 10 x 13 inches and 8 inches deep, and stack 5 plastic silverware trays in

it, you'll have the almost perfect slime mold collecting kit. Don't forget a lens and mosquito repellent.

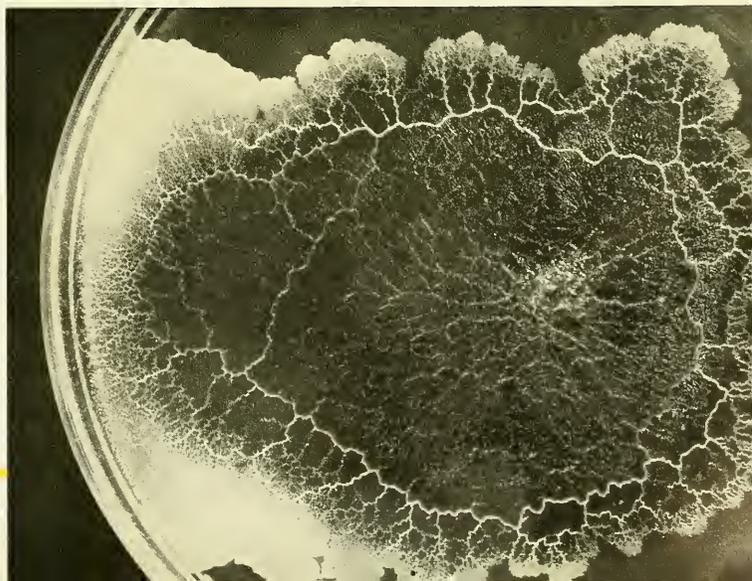
When you find a slime mold, cut the portion of the bark or wood that bears the fruiting bodies and place it in one of the compartments of a plastic tray. After you return home, if you wish to keep these specimens and really start a collection, spread out the trays and let the specimens dry thoroughly. This will take two or three days. After they are thoroughly dry, trim the edges neatly and glue the specimens in small boxes. Pillboxes or matchboxes are excellent for this purpose. Store the mounted specimens in a metal or heavy cardboard box, and sprinkle some moth crystals (paradichlorobenzene) in the box to kill the insects. Insects and mites feed upon the spores of slime molds and can destroy your specimens in a hurry.

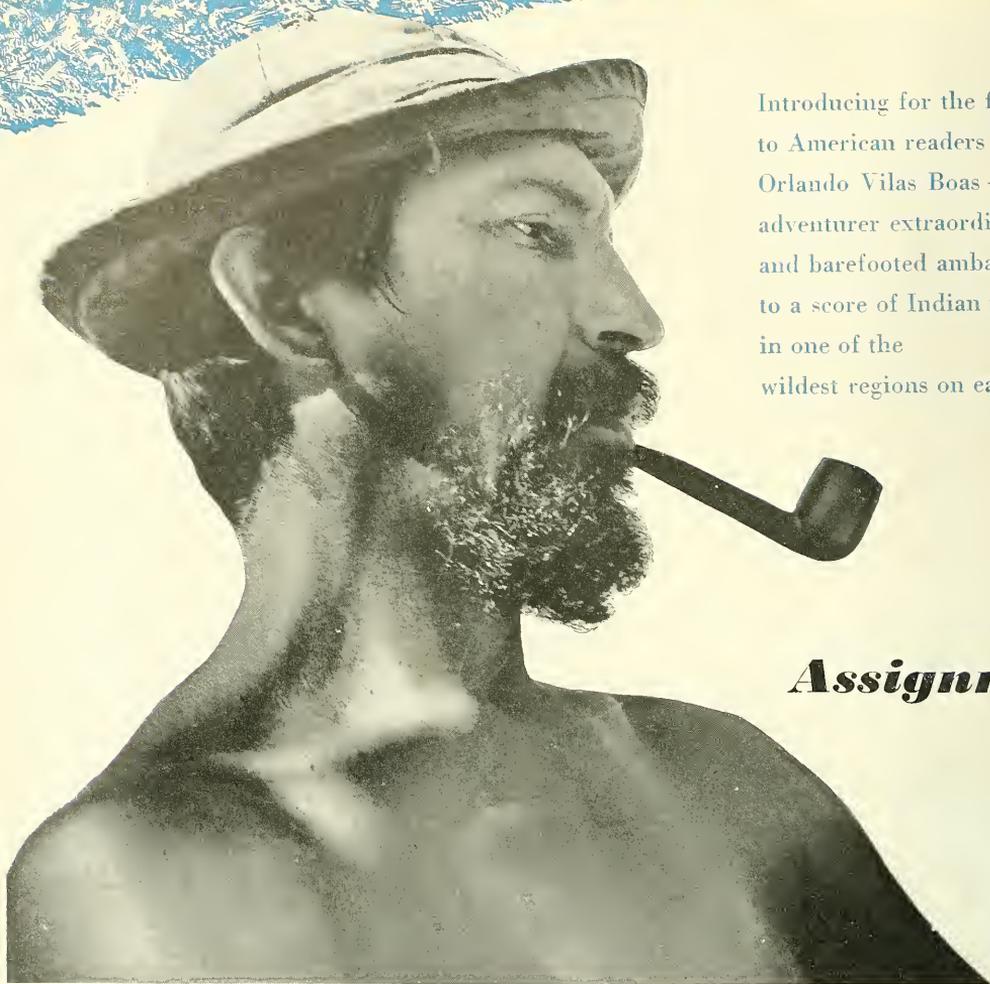
You will inevitably ask, "What good are the slime molds?" The scientist is gradually formulating an answer. He is using the plasmodium for chemical analysis to discover what makes up that "physical basis of life," protoplasm; and he is turning more and more to the slime molds for a study of the fundamental life processes. The slime molds may hold the key to the mystery of life, but they will not give it up easily.



▲ *PHYSARELLA OBLONGA* forms clusters of tiny yellowish-brown sporangia on orange stalks. The sporangia are thimble-shaped. The entire fruiting body seldom exceeds one millimeter in height

➤ *PLASMODIUM of Physarum polycephalum*, growing on agar in the laboratory. This is the animal-like stage, naked and slimy. The plasmodium of this species is bright yellow





Introducing for the first
to American readers
Orlando Vilas Boas —
adventurer extraordinary
and barefooted ambassador
to a score of Indian tribes
in one of the
wildest regions on earth

Assignment

▲ A CASUAL PORTRAIT of the man who cut a trail
to the heart of South America and found his life-

work among the jungle Indians of the largest un-
explored territory in the Western Hemisphere

Part IV:

I knew that the man I had come to the center of South America to meet was a courageous explorer. And as I lay in my hammock waiting for him in a thatched hut at Jacaré in the headwaters of the Xingu River, my thoughts went back to the expedition that started him on his fabulous career.

Orlando Vilas Boas was born in the town of Botucatu in the state of São Paulo, the son of a back-country lawyer. At the time the

Roncador-Xingu Expedition was forming, he was working for one of the oil companies. The purpose of the expedition was to make emergency air strips on the Great Diagonal from Rio de Janeiro across the Amazon Basin to Caracas, Venezuela, and Miami. The most frightening obstacle that lay in the path of this short-cut between the two largest countries in the Western Hemisphere was the territory of the Chavante Indians. Yet the plan required that a supply route be cut through it.

This was before any of these most dangerous of all Brazilian Indians had been brought into peaceful relations. It was in 1941 that Genésio Pimentel Barbosa and his five companions, while trying to give peace offerings to the Chavantes, were clubbed to death and cut to pieces by them in this very territory. In the same year, Orlando Vilas Boas' mother and father both died, and he put in his application for a place on the Roncador-Xingu Expedition, though he must have known that it was the most expertly



▲ A VIEW on the Tuatuari, a tributary of the Kuluene River. Near the source of this stream is located the Indian village where the two Vilas Boas brothers now have their headquarters. A third brother, Leonardo, is also in the Indian Service, several hundred miles to the northeast

Amazon

▼ RETURNING from a long expedition toward the Amazon: a typical scene in the headwaters of the Xingu River. Orlando Vilas Boas is wading at right; his brother Cláudio is in the stern of the dugout they use on their trips of inspection and exploration

By

EDWARD WEYER, JR.

Editor, NATURAL HISTORY MAGAZINE

Photographs by the author

trained group ever to explore the Amazon Basin. It was to have some 60 scientists, technicians, scouts, and frontiersmen, all under the leadership of Flaviano Mattos Vanique. The purposes of this expedition were similar to those of our own Lewis and Clark expedition, but its scientific tools overshadowed the grandest dreams of those who opened our own West.

What, you might ask, could an unknown oil worker in São Paulo have to do with such a plan? To Orlando Vilas Boas, the undiscovered





▲ THREE OF THE INDIANS at Orlando's village, who permitted the author to record their tribal music

▼ THE PRESENT HEADQUARTERS of Orlando Vilas Boas. The poles support an aerial for a feeble radio



▲ A YOUNG INDIAN helper they call Te ente ("Lieutenant"), returning up the Tuatuari after a journey of exploration. Cláudio is in the stern

ered lands beyond the frontier were only a dream. But someone must have known a born explorer when he saw one, for Orlando was chosen from the many applicants. So were his younger brothers Leonardo and Cláudio. Measured by the results, Fate must be said at this point to have thrust a hand into the turbulent history of the largest remain-

ing wilderness in the Western Hemisphere.

At the outset of the expedition, Orlando Vilas Boas was assigned to an advance guard of sixteen men, a spearhead to cut a trail through the stronghold of the Chavante Indians. This was the land between the Rio das Mortes (River of the Dead) and the Xingu River,

an area as large as New Hampshire and Vermont, and hideous in reputation. I doubt that there was a more dangerous region of its size anywhere else in the world.

It took Orlando and his companions six months to make the journey, but when he reappeared at Chavantina, his men had cleared the ground for two air strips in the



ONE of Orlando's Indians, exhibiting the headdress and war club of a hostile tribe, the Xicão (pronounced Shee-COW). In their only effort to establish peaceful relations with this tribe, Orlando and Cláudio were attacked in force

middle of the wilderness and reached the Rio Sete de Setembro, which flows into the Kuluene River, a large tributary of the Xingu. All this without losing a man. From that time on, Orlando's jungle know-how and his remarkable talent in dealing with the Indians kept him at the very front of the advance to the northwest. To him were entrusted the most hazardous tasks. In the wilderness far to the northwest of Jacaré, the expedition, with strong support from the Brazilian Air Force, made an air strip in the Serra do Cachimbo, which

anchored the axis of the Great Diagonal.

We have to admire the strength and courage of the man to endure so many years of difficult travel. But perhaps most surprising of all, instead of returning to civilization for some rest and a hero's welcome, Orlando Vilas Boas chose to remain in the jungle.

Scarcely anyone had ever heard of Orlando Vilas Boas outside of Brazil. Even in Rio, when I asked for information from those who would know most about him, I would be told, "He is practically a

legend," or, "He has great influence among the Indians; he stays in the jungle."

I was lying in my hammock pondering his unbelievable career and worrying that he might not pass through this Indian village before I would have to start back to the Museum in New York, when in he walked—in his bare feet! What I saw was a pint-sized Robinson Crusoe with a jet black beard and the eyes of a mystic. His only clothing was a pair of ragged pants. His shoulders were deeply sun-tanned, and on his head sat a bleached, shrunken canvas hat. I think he only weighed about 115 pounds, and he looked about 35 years old. His face was gentle and made me think of the prophets of old.

This was the man I had been told was virtual ruler of an area as large as New England.

"I offer you my respects," I said in the Portuguese I had learned solely to talk for a few hours with this man. "Have you made a long trip?"

"Nearly three hundred miles down the Xingu. I heard you were coming and waited eight days, hoping you could go with us, but the rivers were falling and we had to leave. Will you come to our village?"

Soon we were in his dugout, heading up the Kuluene River toward a village which, so far as I know, no other North American had ever visited.

During the five days I was with this man, I concluded that in all the far flung frontiers of the world where civilized people come in contact with natives, it would be hard to find a more remarkable person than Orlando Vilas Boas. I began to understand what Lewis Collow, the author of *Amazon Headhunters*, had told me. He had crossed trails with Orlando once and had entered an Indian village with him. "Just because I was with Orlando," he said, "the Indians were at once friendly with me. Beautiful girls eighteen and twenty years of age came up to me and wanted me to pat them. There is something in

his presence. I can only call it love." I was also beginning to realize how much my own friendly reception among the Indians of this region may have been due to the trust created by this one man.

Centuries of cruelty preceded Orlando in the Amazon country and elsewhere in South America. Between 1600 and 1650, no fewer than 30 slave-hunting expeditions from the settlement now known as São Paulo thrust deep into the heart of Brazil. In the following century, prospectors and others penetrated again and again to the country of the Chavantes, and the Indians vowed to defend themselves to the death against the newcomers. Up and down the land, Indians were carried off as captives—men, women, and children,—and thousands of others died in epidemics of smallpox and other diseases brought by civilization. These epidemics have continued down to the present day and so have the wars with the Indians. Only about one Indian in six remains today.

A friend of mine once gave me a sample of the cruelty that has helped to form the South American Indian's feeling about civilized people. It happened in a disputed area in the borderland between Brazil and a neighboring country, to which my friend has been sent as the administering officer for two years. When he reached his post, he asked the Indians how they felt about white people. "We cannot easily feel that you are our brothers," he was told. "We still remember when the rubber prospectors came. On Saturday nights, they would cover one of our men with kerosene and light it. As he ran through the dark trying to get to the river, they would try to shoot him."

As we moved up the Kuluene River in Orlando's dugout, I wondered whether anyone had ever

had a harder time of peacemaking than he had or had succeeded at it better. I call it a miracle that he is still alive.

"What is the most dangerous experience you ever had, Senhor Orlando?" I asked.

"If you mean in relation to the Indians," he answered, "none really too dangerous. During the six months while we were crossing the Chavante territory, the Indians only attacked or tried to attack twice, when we stopped to build an air strip. If we stopped for more than ten days, the Indians apparently thought it strange, but there was no real danger. Then we had contact with the Juruna, but nothing serious happened there, either, for we were quite prepared. They thought the meeting very strange, but they are Indians of good disposition. Later we came to the wild part of the Kajabi tribe, when we made the camp of the Rio Arinos, but we were also successful there. We have not yet succeeded with the Tumuri, who are called the Xicão by the neighboring Indians."

"Where are they?" I asked.

"Just 25 miles west of the village where we are going, on the Batovi River. Recently they stopped our approach with a rain of arrows. We

leave presents where it is possible to do so, hoping it will prove that we wish them no harm. We will try again in a few months. To the north less than 40 miles are the Suyá. They have not yet had any contact. We are now also trying to meet the Tchukahamãe, a group to the south, whose own name is Okronheti."

"Do you think the hostility of the Indians is the result of old grievances against civilized people or are some of the Indians simply more warlike by nature?" I asked.

"Mostly because of grievances. Here on the Xingu, where the Indians have had little contact, they warred with each other but not against us. They are good people."

In my brief travels, I too had learned to love these Indians, but I could not forget that the Xingu Indians had killed quite a white people, and I mentioned this.

"But these killings had special causes, understandable to anyone knowing the customs of the people and their tendency to protect their own territory. These things happened before the Indian Protection Service [the equivalent of our Bureau of Indian Affairs] brought the policies of General Rondon to the area."



➤ ORLANDO AND HIS PET MUTUN. The bird was perfectly free to fly away into the forest, but it had no inclination to do so



▲ A CAMAYURA INDIAN whom the author met alone one day on the trail near Orlando's village. He carried one spear 22 feet long, in two sections, for use in spearing fish under water

General Candido Rondon, I recalled, had begun his career as a frontier army man around the turn of the century, when the policy in Indian affairs was "Shoot them on sight." He foresaw that the strife would not stop until all the Indians had been destroyed, and he set out to reverse the entire policy, indeed the attitude of the nation.

By 1905, he had begun his campaign for peace among the Indians,

and by 1910 he had established the rule "Die if you must, but never shoot an Indian." Thus, you will find no comfort in court in Brazil if you draw a gun on an Indian, even in self-defense. I know of no land on earth in which the principle that a soft answer will turn away wrath has been so dramatically tried. General Rondon himself was wounded twice with arrows.

Recalling how Genésio Pimentel

Barbosa and his five men had not even reached for their guns when the Chavantes slaughtered them, I ventured to say, "The cost has been heavy."

"Undeniably, many have lost their lives, but no other way is possible, and we follow today exactly the humanitarian ethics of General Rondon—respect for the culture of the Indians, their social organization, their customs, their family life, and their religion."

Over three hours after leaving Jacaré, we turned into a river feeding the Kuluene from the west, up which we were to travel in our dugout almost as far as the water was deep enough. The hottest part of the day was over, and the trip up this beautiful stream, which wound swift, smooth, and deep among the palms, was one of the most pleasant of my whole journey. This river was the Tuatuari, the same on which Kalervo Oberg visited a Camayura village fairly near the mouth in 1948, now apparently abandoned.

It was about six in the evening when we beached the dugout and carried our baggage up the path to the village that is Orlando's headquarters.

Indians of four or five different tribes came out of their huts to meet us, and I could not keep from imagining how different it would have been to march alone into this wild assortment of jungle brothers so far back in the wilderness. The affection of the Indians for Orlando would be proof for anyone that kindness can create harmony among the most opposite people and that a sympathetic heart does away with the need of bodyguards or treaties.

Several of the men in their twenties and thirties had no doubt been chosen by Orlando for the muscular strength they could apply to the building of his headquarters. They were physically the most formidable Indians I had met. Partly because dusk was falling and perhaps because only about eight months had passed since this spot had been cleared for a village, the



▲ THE INDIANS of the Upper Xingu are clean, vigorous, and healthy. Malaria and "grippe" are the only diseases from which they are known to suffer

general atmosphere was more primitive and raw than I had yet seen. You couldn't see the river, only the close circle of the forest. And the various types of Indians with their differing tongues and habits, added to the effect.

As soon as we had strung our hammocks under a lean-to at the edge of the jungle, Orlando began to write up some of the notes of his trip. We were in one of the two rooms in a grass hut where all his belongings were. The scene was imprinted deeply on my memory. He was seated on a rough stool that was covered with the

spotted skin of a jaguar. He was writing in a notebook on his knee with a finely sharpened lead pencil, his page lighted by a kerosene lantern hanging from the thatched roof. On his free knee sat a little Indian boy. The arm of another Indian boy was around his neck, and a parrot was perched on his shoulder. Underneath his legs, a bird almost as large as a turkey kept bothering him for attention, which it received every few minutes. A long low dog something like a dachshund lay with its chin on one of his bare feet.

Within reach was a small pack-

ing box that had been made into a bookcase. Now and then, Orlando would take a paper-bound scientific book from its shelves, consult it, and put it back. The three shelves would have totaled eight feet of books, almost entirely technical. In the center of the bookcase was a much-worn copy of the Bible. An Indian woman came to be treated for a small injury, and Orlando bandaged it.

This scene was one of the most touching examples of human brotherhood that I have ever seen. I couldn't help but think of all the people who sweat their lives out trying to love God without ever loving their fellow man.

It was in this village, around the campfire at night, that I recorded some of my best native music, and I was deeply impressed with the cultural heritage of these various tribes as shown through their songs, stories, and spiritual philosophy. The exotic quality of some of the music has moved audiences wherever I have played it, and its importance in the long story of mankind is the greater because so few places are left on earth where art forms that are truly primitive and unspoiled can still be captured.

Cláudio, Orlando's younger brother, who was assisting him here, had been described to me as a "priest" who never took the cloth and as an extremely self-contained person. But I saw neither of these aspects of his personality. Although he often let his brother answer first, he generally talked freely on any subject I brought up. Their years in the jungle had not given either of them a trace of the toughness that some men like to put on as final proof that the wilderness is theirs. Nor had they lost an interest in the affairs of the world. But the easiest question I asked them during my stay was whether they thought of going back to civilization. They both laughed at once and said, "No indeed."

"How can you protect these people from the diseases of civilization?" I asked Orlando. "On first contact the effect is disastrous."



▲ CLÁUDIO VILAS BOAS, philosophizing in his hammock. The little calendar on the wall tells that it is the fifth of June, but what this matters almost 1000 miles from the coastal cities of Brazil is a little hard to say. Note the pet bird in the foreground



▲ ORLANDO LISTENING for a message from his brother Leonardo in another part of Brazil. The long-awaited message failed to come through during the five days that the author stayed here

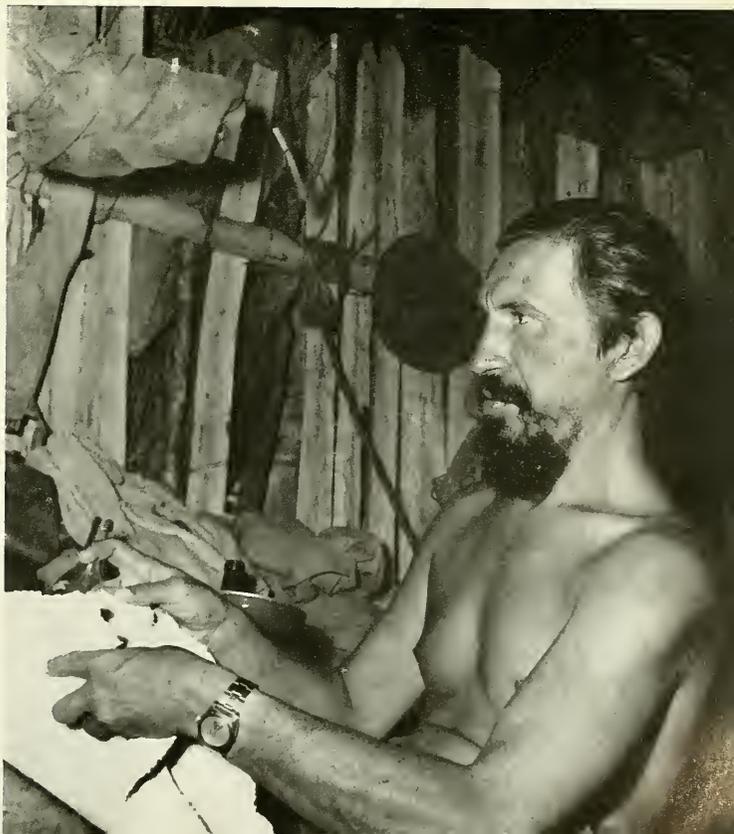
"You are quite right, an epidemic of measles, for instance, would be a terrible calamity here. But the Indian Protection Service creates an iron belt around the region, so that the civilized person who enters is carefully selected. The Indians of this region do not have one case of tuberculosis. Measles, chicken pox, smallpox, and mumps, are unknown. They suffer only from malaria and epidemics of grippe. Against these, our drugs work wonders."

"You think then that science can safeguard these people against the worst losses?" I said.

"A glance at the record shows that it is worth trying. Take the Bororos, for instance, to the southwest of here. Originally there were 5000 of them. Today there are 150. In only 50 years, 4,850 died. For the pleasure of being converted to our ways and beliefs, they paid a heavy price. If you go among the Bororos today, you will hear them playing our religious music beautifully on their trumpets and clarinets. But you will not see them dance their traditional dances, nor do they fish, or hunt, or farm. They keep on dying easily and being

continued on page 46

▼ A MEAL of manioe pancake. In the heat of Mato Grosso, Orlando needs very little clothing, and his sustenance comes largely from the forest. Various birds and deer are abundant



(This article is condensed from a chapter in a book soon to be published, *American Seashells*, by R. Tucker Abbott. (D. Van Nostrand Co., Inc.)

How to Collect Shells

Tips from an expert on a hobby that will bring you beauty, knowledge, and adventure at the small price of perseverance

By R. TUCKER ABBOTT

Associate Curator, Division of Mollusks,
U. S. National Museum

Thom Bacon
photo from
Three Lions

▼ BEACHES up and down the land attract thousands bent on discovering rare and beautiful specimens

Ace Williams photo from Black Star





Fred G. Koeth photo from Frederick Lewis

▲ TREASURES in infinite variety await those who like to vacation within sound of the sea

SEASHELLS and man have been closely associated since the dawn of civilization when primitive people gathered snails, oysters, and other kinds of mollusks along the seashore for food, implements, ornaments, and money. In modern times, thousands of people have become interested in collecting shells purely for their aesthetic beauty and their educational value. Their beauty and permanence make shells an ideal thing to collect, and the infinite variety of their form and color proves an endless source of gratification not only to the collector himself but to his friends.

Collectors of fancy seashells are constantly in search of specimens of outstanding quality. A number of species are well known for their high value or unusual beauty. Perhaps the classic example is the *Glory-of-the-Seas*, of which only twenty-three specimens are known. In addition to these twenty-three specimens, three were destroyed during World War II and eight, formerly known to exist, are missing. A search in Grandmother's attic or along some East Indian

beach will doubtless bring others to light. But there is a wide range of personal taste in shells, and it is not only the so-called rarities in museums that are worthy of note. The man who covets a brilliantly patterned Olive Shell of rich golden-red colors may see little in a tiny white shell that another collector treasures for its intricate snowflake sculpturings. For many shell collectors, desirability is gauged by the top price that a specimen may bring. For others, the important judging point is the scarcity of the species in nature or perhaps its rarity in collections.

Instructions for collecting seashells are much akin to revelations of the secrets of good cooking. Everyone has his favorite methods. There are, however, a number of fundamentals that will help guide the collector in obtaining a representative series with the least trouble.

The most successful collectors mix together four ingredients to obtain what appears to most of us "unusual luck" in finding good shells. These are knowledge of the

habits of mollusks, a familiarization with the physical conditions of the ocean and the seashore, a sensible choice of collecting equipment, and, perhaps most important, a large proportion of perseverance. The first three can be learned from books and from veteran collectors, but only keen observation and many hours of trial collecting will develop satisfactory techniques.

Low tide is obviously the best time to collect, and most collectors make long-range plans to catch the spring tide, consulting the Coast and Geodetic Survey Tide Tables to plan in advance for the lowest tide of the month. Tide Tables for the Pacific and Atlantic coasts may be obtained for a fraction of a dollar from the U.S. Department of Commerce, Washington 25, D. C. Since the rise and fall of tides are caused by the attraction of the moon, and to a lesser extent by the sun, a good simple rule is to plan your collecting for the time of new and full moon. Low tide lasts for about fifteen minutes, but profitable collecting may be done one hour before or after. It is useful to

know that the tides are about 50 minutes later each day. Beware of the dangers of rising tides, especially if you have waded a long distance out to some small isle at low tide. Tide currents can be extremely strong at the narrow mouths of inlets, and swimmers are urged to familiarize themselves with local conditions.

Most species that live between the tides reveal themselves more frequently about half an hour after the tide has begun to rise. A great number of species are more active a few hours after dark, while others are content to wait until early morning before starting on their foraging missions.

Certain seasons are most favorable for certain collecting. September seems to be the best time, for instance, to gather shells on the Carolina strands. During late April and early May there is more likelihood of the Purple Sea Snail *Ianthina* being washed ashore on the east coast of Florida. After winter gales, some New England beaches may be strewn with large surf clams, *Spisula*.

If one were to use all the collecting equipment that has been recommended by friends and books, he would certainly resemble a Christmas shopper in full knightly armor. Crowbars, bilge pumps, shovels, rakes, sets of screens, hammer and chisels, even water wings and miner's caps have been suggested. It is true that these and many other pieces of equipment are ideal for specific and limited purposes, but for general collecting, simplicity and lightness of gear are most important. Streamlined collecting in the intertidal areas when it is calm calls for little more than a pair of canvas shoes, bathing suit, and a few small cloth bags. Guard against sunburn. Most shells can be picked up by hand, and the more fragile ones can be put in matchboxes or thumb-sized vials.

When a breeze is disturbing the surface, it is impossible to see the bottom, and many collectors use a glass-bottomed bucket or a diving mask floated on the surface to clear

the view. A square or oblong bucket about a foot each way and ten to twelve inches deep may be made of light wood. The glass is set in the bottom and held in place with a thin layer of white lead and strips of molding or quarter rounds. Paint the inside dull black to avoid reflections on the glass. The water bucket is useful to those who enjoy diving for shells. It not only serves as a friendly support between dives but may be used as a collecting receptacle. Diving masks or water goggles are indispensable for collecting many shells that are normally found in waters down to twenty feet in depth.

A fine-mesh wire screen bought in any kitchen utensil store can be put to excellent use in sandy or muddy areas, where many interesting small shells live. Screening for mollusks is a favorite pastime with many collectors. Copper mesh can be used if you plan to screen over a period of a few months. Forceps are sometimes useful in getting small shells out of rock crevices, but in general it does not pay to search individually for minute shells. Mass screening or taking a large bagful of bay bottom or beach drift home for leisurely sorting brings richer rewards. Shaking clumps of seaweed over the screen often gives encouraging results, for many uncommon species are found nowhere else. Breaking apart coral blocks often yields interesting rock boring clams.

If you have yet to collect your first live Olive or Terebra shell, wade along the shores of a sandy bay on a quiet, moonlight night and with the aid of a flashlight follow along the trails in the sand. A dozen daytime visits to the same locality will never compare to that hour of night collecting. Not only are sand-dwelling mollusks on the move, but in rocky regions the cowries, mitras, and murex shells are out from under their hiding places and traveling along in full view.

Overcollecting is to be avoided in some localities, particularly if certain species have taken several

seasons to build up their population even to a moderate size. By leaving at least most of the mature specimens and perhaps one or two adults you will assure yourself of good collecting at the same spot later. While it is unreasonable to expect people to roll back the rocks they have overturned, some collectors do this in order to obtain additional specimens on their next visit. Once destroyed by sunlight and air, the protective algae and the sponges need many months to grow back. However, the blame for the extinction of many beautiful mollusks at Lake Worth, Florida, and in many other places rests not with greedy collectors but with superdrainage experiments, city pollution, and construction work.

Keeping accurate information with your collection is essential. Many private collections are eventually left to museums for the enjoyment and use of future generations. Today's crowded museums must rightfully dispose of specimens that have no data and are therefore of no scientific value. Large and beautiful collections representing much time and cost would have been of inestimable value to science had someone only taken the time to record where each specimen was collected. "Australia," "Hawaii," or "California," is not enough. A good entry would read: "North end of Captiva Island, Lee County, Florida. Leo Burry, collector. July 4th, 1952." Many careful collectors add interesting notes concerning the depth of water, type of bottom, abundance, and so forth. A rare shell in perfect condition, correctly identified and with accurate information, is almost worth its weight in gold.

The beauty and value of a collection depends largely on the manner in which specimens are cleaned and the methods in which the shells are arranged and housed. The majority of snails and clams can be cleaned of their animal soft parts by merely boiling in fresh or salt water for about five minutes. The meat can then be extracted with a bent safety pin or an ice

pick. Shells having a highly glossed or enameled finish, such as the cowries and olives, should never be thrown directly into boiling water. Start them in warm water, bring slowly to a boil, and then let cool gradually. Any rapid change in temperature will crack or check the polished surface. Save the horny operculum, or trapdoor, when it is present. A plug of cotton will hold it in the aperture after the shell is dry.

Many shells are difficult to clean even when the boiling system is used. Usually the tip end of the animal's body remains in the shell



U. S. Navy photo by Abbott



U. S. Navy photo

▲ TRUE SONS of Triton who don't mind a pounding do their searching where the surf breaks

◀ THE FACE MASK is valuable for shallow diving

▼ A BEACHCOMBING FAMILY examines their day's haul, which happens to include a lot besides shells

Nolan Patterson photo from Black Star

of such genera as *Terebra*, *Vasum*, and *Xenophora*. Vigorous shaking or syringing with a powerful blast of tap water will get most out. Filling the shell half full of water and setting it out in the shade for a day or so with an occasional syringing will help. If odors still persist, a few drops of formaldehyde in the shell, plus a cotton stopper, will eliminate the objections.

In the Pacific Islands, most collectors bury their shells alive a few inches under soft, dry sand. In a few weeks they are dug up and washed. The sand must be sifted for smaller shells and for the opercula. Some people who do not object to flies set their shells upside down in the sand and allow blowfly larvae or maggots to clean out the meat in a week or so. Vigorous



rinsing of the shell is then all that is necessary.

Many delicate shells, including most land ones and small fragile clams, may be placed in fresh water overnight and then syringed or picked clean. The shells that are composed of two halves hinged together are usually the easiest to boil and clean. Allow the pairs to dry in the flat or "butterfly" position as this will permit ready inspection of the hinge teeth for identification purposes.

Many tiny shells obviously cannot be boiled and picked clean. Shells less than a third of an inch may be soaked in seventy per cent grain alcohol and then placed in the sun to dry thoroughly. Isopropyl alcohol may be used, but it is best to use this at fifty per cent strength. Never use formaldehyde (or formalin) to preserve mollusks. The shell will turn soft, lose color, and often crumble away in a few months.

Most shells are ready for display in their natural state. However a large number of gastropods, whose beauty is hidden by coral and algal growths, need a certain amount of "face lifting." A stiff brush, soapy water, and diligence will usually suffice. Many collectors soak specimens in a strong chlorine solution for a few hours to remove part of the unsightly growths without damaging the shell. If you have several similar specimens, however, it is best to keep at least one in its natural state.

Very few expert collectors use acid in treating shells, since this often gives specimens a very unnatural, although colorful, sheen. It is used occasionally to remove limy deposits and to brighten up old specimens. Commercial dealers dip the Pink Queen Conch, for example, for five or ten seconds in a vat of one part muriatic acid to four parts of water and then rinse in fresh water. Shells can be dipped with forceps in full strength oxalic

or muriatic acid for two seconds and then immediately put under cold running water. This may be repeated until the desired effect is obtained, but it should be pointed out that any acid treatment ruins most shells for scientific study.

Polishing abalone shells and cutting cross sections of larger shells require special equipment such as electrically run burring wheels and circular diamond cutters. A visit to a shell factory will be of profit to those wishing to undertake this interesting hobby.

Although seashells are easy to keep since they do not deteriorate and generally do not fade in color like many insects, they present special problems in housing because of their many sizes and shapes. There are three general types of collections—the knick-knack shelf, the display arrangement, and the study collection.

The first of these is usually the result of a summer's random beach collecting by the novice. Many important private collections have started in this manner.

The display collection for mu-

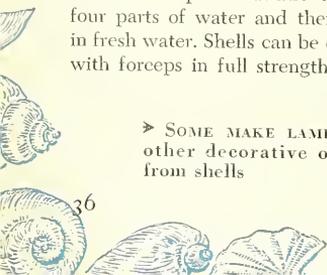
seums, libraries, clubs, or even the home is limited by the pocketbook and by the type of secondhand display cabinets that can be afforded. Little more is needed than common sense to secure good artificial lighting, attractive but neutral backgrounds, neat labeling, and the proper spacing of wisely selected specimens. The exhibit should be designed for its eye-appeal as well as for its interest. One has a wide choice of themes—a selection of local shells, of mollusks of economic or medical interest, shells of odd habits, or examples of colors and patterns. Miniature display boxes with cotton background and glass or cellophane covering are very popular. If of uniform size, they can be neatly stacked in a closet when not in use. The labels should give the scientific and common names and the geographical range.

The name "study collection" may sound ominous to some, but this type of housing can actually bring more joy and less work than any other system. It is not only neater, more compact, and just as attrac-

Carrall Seghers photo from Black Star



► SOME MAKE LAMPS and other decorative objects from shells



tive as the display type, but it also permits the collector to locate any specimen quickly and add new material with the least rearranging. The choice of cabinet and style of drawers for this collection will be limited, for this, by the collector's pocketbook. If the cabinet is oblong and about table height, additional cabinets can some day be set alongside for desk space. Pine, basswood, or any of the whitewoods can be used. It has been reported that certain oaks have a detrimental effect on shells that have been stored away for years. The cabinet door should swing all the way open but permit the drawers to be pulled out when it is only open ninety degrees. Some students prefer removable doors. The ideal cabinet is 40 inches (or 80 inches) high, 22 inches wide, and 32 inches deep. Runners for the drawers are 30 inches long. If wooden, they can be $\frac{1}{2} \times \frac{3}{4}$ inch and set $2\frac{1}{4}$ inches apart; if of galvanized sheet iron, $2\frac{1}{2}$ inches wide and bent along the midline to form an L. The inside measurements of the wooden drawers would be 20 inches by 30 inches and $1\frac{1}{8}$ inches deep. No runners or handles are necessary on the drawers.

All cardboard trays to hold specimens should be $\frac{3}{4}$ inch in depth and all of their other outside di-

mensions should be multiples of the smallest type of tray. In other words, if you start with $1\frac{1}{2}$ by 2 inches, the next larger tray is 3 inches by 2 inches, then 3 inches by 4 inches, then $4\frac{1}{2}$ inches by 6 inches, and the largest of all would be 8 inches by 9 inches. Five sizes is enough. Odd-sized trays prevent neatness. Cardboard trays covered with glossy-white enamel can be purchased in any large city, or you can make them, holding the corners together with adhesive tape or butcher's tape. The labels should be pasted on the lower left corner of the lid. A duplicate label or a slip of card bearing the catalogue number should be placed in the box. Some people can afford to have glass-covered boxes. Smaller specimens are kept in small glass vials without necks. Use cotton for plugging them; corks are expensive and eventually deteriorate.

A catalogue is most essential to prevent loss of valuable locality data. Each specimen should bear the same number, written in India ink with a fine pen, as the label and catalogue entry, for identification in case of accidental spilling. Run your catalogue numbers from one on up in a thick ledger about 12 inches by 8 inches and give more space to "locality" than any other section. Do not experiment with

mystical letters indicating the locality or other information or waste time with a card catalogue. Keep shells that are too small to number in vials or covered boxes with a small slip bearing the catalogue number.

Your collection should be arranged in biological sequence, that is with the first drawer containing the primitive abalones, followed by the limpets, and on up to the specialized bubble shells (*Bulla*). You may want to place your unsorted or unidentified material in the last few drawers.

Exchanging is an ideal way of sharing your local rich hauls and obtaining species beyond your collecting sphere. A list of the many hundreds interested in exchanging is published in several directories of conchologists and naturalists. Some people make up elaborate exchange lists, which they send around to other collectors. Exchanging is worth while and exciting, but it is time-consuming, and you must be careful not to let your main collection suffer.

Shells mailed or expressed up to 20 pounds in weight will travel safely protected by loose newspaper and packed in cardboard cartons obtained from the grocery store. Mailing tubes are good for small lots. It is better not to try to send living snails through the mail.

If you start collecting shells, you'll meet a lot of people you never would have known otherwise, and if you get too expert on the local shells, you'll be plagued with requests for help in identifying specimens. So while you are learning, have a heart. Ask first whether the identifier is willing to help you, and never send more than five species at a time. Photographs are not satisfactory for identification. And remember that one of your own shells may prove a welcome gift to your identifier.

◀ THE ULTIMATE in accessibility and educational value is attained by the collector who builds up a study collection

Courtesy Ralph Humes, Miami, Florida





▲ A LARGE SCHOOL of fish stranded on a sand bar. They lash their tails high in the air in their efforts to escape out to sea. If they fail .

Blackfish BONANZA

Pilot Whales doomed by the falling tide

provide the finest grade of oil on the market

By LYNWOOD CHACE

THE average person may think of a blackfish as an ordinary fish about the size of a herring; but the blackfish shown in these photographs are considerably larger, and they are not fish at all. They are mammals and therefore suckle their young just like our familiar furred, four-footed animals. Their

other name is Pilot Whale. Their food consists of squid and various kinds of fishes. The adult blackfish grows to 30 feet in length and weighs up to three tons. The young are five to six feet long at birth, and the mother nurses them for several months.

Blackfish travel in schools, fol-

lowing a leader. As many as 2000 have been seen in one school, although the usual average is about 100. They were always taken by the whalers at sea, but nowadays most of them are taken from schools stranded in shallow water, where they would in any event be killed by the falling tide. Whales

and porpoises do not have the muscular equipment to breathe against their own stranded dead weight. Accordingly, hunting of this sort does not threaten the survival of the species.

From July until October, the blackfish go into harbors in search of food. It is then that they can be captured by the receding tide, and since the blubber of the blackfish yields the finest grade of oil on the market, manufacturers keep fishermen on the lookout to report strandings. Incidents like the one shown in these photographs are common at Cape Cod and also along the Virginia and North Carolina capes.

The fishermen immediately go out on the sand flats to where the blackfish are stranded and lance them, after which they begin cutting off the top of the head, or blubber cap, which contains this very fine grade of oil. Good oil depends on fresh blubber, so they

must work fast before the carcass begins to deteriorate. Meanwhile, the oil manufacturer is notified and trucks are sent to the location where the cutting is taking place, to carry the blubber to the refinery.

It is a mistake to suppose that only the tops of the heads of the blackfish are worthwhile. The body blubber makes a perfectly good common animal oil worth perhaps 75¢ a gallon. Furthermore, the remainder of these great carcasses can be converted into stock food and fertilizer. Modern whalers have long since learned that the "waste" in the carcass of a whale has about the same market value as its total yield of oil. Therefore, it seems a pity that the workmen sometimes dig a large pit on the shore, from ten to fifteen feet deep, and bury the carcasses.

When the blubber caps arrive at the refining plant, the men begin at once to prepare the blubber for the try-pots. The extraction of good oil

depends on the skill and ability of these men. They must know just where to cut the blubber and which portions to discard because they would not produce good oil. They call this process cutting the blubber into "bible leaves," because the blubber must be cut into very thin slabs.

The try-pots are steam-jacketed kettles, and the blubber must be tried very slowly. The oil must have ample time to seep from the blubber, and it must not be burned. After removing the oil from the try-pots, further refining takes place, and the entire process consumes three years. There is a 50 per cent loss during this long and careful process, which gives the oil long life and such fine qualities that it can be used for the most delicate watches. This also gives the oil an extreme tolerance to temperature changes. Machinery lubricated with this fine oil will function properly either in frigid conditions or in the most intense heat of the tropics.

Proof of the qualities of blackfish oil was given when a torpedo was

▼ THE NEAR-BY FISHERMEN hear of their plight and launch their boats to hurry to the scene and take possession of them





▲ THE FISHERMEN LANCE the blackfish as soon as they are able, so that they can begin cutting off the tops of their heads, or blubber caps, which contain the valuable oil

sunk deep in mud for several months and then lifted to the surface. Mud and water had soaked into the torpedo, and it was badly rusted except for the gyro gear. The blackfish oil had so protected the mechanism that it had not rusted at all.

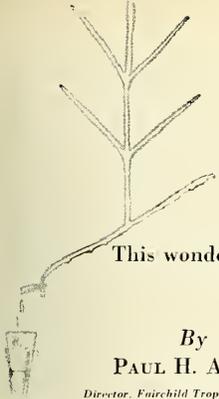
The cap of a full-grown blackfish will produce four gallons of oil. The refining of blackfish oil is a preserved knowledge, known to very few men and generally passed down from one generation to the next.



▲ HERE is a good batch of blubber caps, they will be rushed to the factory, because good oil depends on strictly fresh blubber



▲ BLACKFISH OIL can be refined for use in the most delicate machinery. It is tolerant to great extremes of temperature



The Cow Tree

This wonder tree of the tropics yields a rich milk, which is popular among the natives and in coffee cannot be distinguished from fresh cream

By

PAUL H. ALLEN

Director, Fairchild Tropical Garden

IF the tree had not been so large, I might have thought that the man was tapping rubber. He had been making a hillside clearing not far from where I live in Costa Rica, but now he made a gash with his machete in the trunk of one of the standing trees. As the milky fluid began to flow, he fashioned a spout out of a bit of leaf and let the latex run directly into his mouth. Obviously he found it to be refreshing.

Here, I said to myself, is a forest product that may stand me in good stead some day, and I noted carefully the appearance of the bark, leaf, and fruit and questioned him as to its relative abundance.

The earliest and probably best description of this tree is the one passed down to us by the great naturalist and explorer Humboldt, who saw it on the north coast of Venezuela. "For many weeks," he wrote, "we have heard a great deal of a tree whose juice is a nourishing milk. The tree itself is called the Cow Tree, and we are assured that the Negroes on the farm, who are in the habit of drinking large quantities of this vegetable milk, consider it highly nutritive. . . . It was offered to us in calabashes, and though we drank large quantities of it, both at night before going to bed and again early in the morning, we experienced no uncomfortable effects." The superintendent

➤ To APPRECIATE the size of this Cow Tree, find the man. He is standing just to the right of its base





▲ FRUITS AND SEEDS of the Cow Tree. The leaves are shed in the mid-winter dry season

of the farm assured Humboldt that the slaves became visibly fatter during the season when the Palo de Vaca yielded most milk.

The trees are sufficiently plentiful in some parts of Costa Rica to give a distinctive aspect to the landscape. During the seven long months of our heavy rains, the great forests that sweep unbroken to the crests of the highest hills form a somber tapestry of dusky greens, but with the onset of drier weather, a profound change comes to the woodlands. Over extensive areas, the trees drop their leaves for a brief period and suddenly appear brown and wintry. By late December, the hillsides are a varied mosaic of bare, rounded crowns, alternating with domes of fresh, pale green leaves, producing an effect almost like that of an Ozark or Appalachian spring. Although other things are present, by far the greatest number of these fresh green trees, at least on the hillsides, are



MILKING THE COW TREE. A few well-placed gashes in the bark, a spout made from a leaf, and soon the palatable latex is flowing. It can be chilled and whipped

the Cow Tree (*Brosimum utile*), the famous source of the vegetable milk.*

When seen near at hand, the trees are of noble aspect, with sheer gray trunks. They are a hundred feet or more in height and up to six feet in diameter above the somewhat buttressed base. There may be only one or two of them per acre on the lower slopes, but they often meet on the ridges in a great, almost unmixed company. They range from Costa Rica southward to Ecuador and across northern South America, usually in areas of high rainfall. They are known to the local inhabitants by such diverse names as "Vaco," "Lechero," "Mastate," and "Palo de Leche."

In former times, the Boruca Indians of our regions used the bark of the tree for the manufacture of a coarse cloth, but this is fast becoming a lost art. There is every indication that the tree will continue to be known for its nutritional utility long after its other uses are forgotten, even though its food value seems to be somewhat lower than was affirmed by Humboldt. In its pristine state the latex can scarcely be distinguished from fresh cream, and it tastes like the real article when used in coffee. After some exposure to the air, the taste tends to become chalky and slightly bitter. Some of its detractors even say it then resembles milk of magnesia or whitewash. Within about 24 hours it solidifies in the tapping cuts to form a chicle-like substance.

About two years ago I brought a pint of it to Palmar, and we found that it could be chilled, whipped, and flavored with sugar and vanilla extract to provide an acceptable substitute for whipped cream. We served it on pie to neighbors, and they did not realize that it was anything unusual. Animals however, at least dogs and cats, will not touch it.

**Brosimum utile* is not the only Cow Tree, though perhaps the most famous. Even the dogbane family, notorious for its poisonous properties, contains genera whose juice is palatable and has similar uses. The latex of *Lacmellea utilis* is said to be indistinguishable from milk when used in tea, and that of *Lacmellea paraguayensis*, abundant on the hillsides of our area, is creamy and sweet, with a faint but unmistakable flavor of vanilla extract

The end or the beginning for Karen?



At three, Karen is already weak and undernourished. Her barracks-like home in Salzburg, Austria, is damp and draughty. Her meals are meager—meat and butter almost unknown. New clothing and needed shoes are an unthinkable luxury. Her father, a very old man, is an auxiliary worker whose income is enough only for the vital necessities of a barren everyday existence.

Because of her weak condition, Karen cannot move too rapidly, and so she plays with a cardboard box that she calls her doll house. Her artistic fingers keep it neat and clean, as her vivid imagination weaves childhood fantasies. In a city famed for music and song, her future could be bright, but she *must* have more food to supplement her diet and nourish her delicate body. Her shoes and clothes are tattered and outgrown—they *must* be replaced immediately.

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▲ "THE CONQUEST OF MT. EVEREST" one of the most stirring pictures to be put together from on-the-spot material

▼ GETTING SUPPLIES across the ice sometimes involves almost walking a tight rope



▼ COL. H. D. J. HUNT, (now Brigadier Sir John Hunt) leader of the expedition



▲ THE CLIMBERS had to carry oxygen to keep them alive at higher altitudes

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

"Conquest of Everest"

Reviewed by EDWARD WEYER, JR.
Editor, NATURAL HISTORY MAGAZINE

THE three most dramatic exploratory achievements in the physical sense are the discovery of the North and South Poles in 1909 and 1911 and the ascent of Mount Everest last May 29, the highest peak on the face of the earth. Of only the last do we have anything like a satisfactory pictorial record.

The motion picture of this feat, soon to be released by United Artists, is surely one of the most stirring epics ever put together from on-the-spot material.

Ten earlier expeditions had failed to reach the summit, and no fewer than sixteen men had lost their lives in the effort, when Col. H. C. J. Hunt assumed leadership of the 1953 Mount Everest Expedition, consisting of thirteen British subjects and scores of Nepalese assistants, loaded down with tons of special rations, oxygen breathing apparatus, aluminum ladders, and other climbing equipment. Knowledge gained through 30 years of experience was applied to the particular obstacles that Mount Everest presents.

In the motion picture, you will even be taken through the testing laboratories, in which the materials and men were tried—wind tunnels, refrigerators, and decompression chambers, creating conditions identical with those on the summit of Everest. You are left gasping for air even before you follow the expedition into the Himalayas.

Our review-team included two ladies who had never been roped into a climbing party and a man who had once applied for a place on a Mount Everest expedition. The latter, after seeing the ordeal, felt that it was perhaps just as well he had not gone. But one of the ladies wanted to climb the next mountain she got near. The other female critic concentrated on the picture and, in trying to say why you should see it, paraphrased the words of the lost climber Mallory when he told why it was necessary to climb Everest: "We have to climb it because it is there," he had said. As our reviewer put it, "You have to see the motion picture because it is here."

Too much credit can't be given to the photographer T. Stobart and others in the expedition who achieved near-mir-



▲ SOME SPECTACULAR SHOTS of the California Condor appear in the film "Song of the Land"



▲ "SONG OF THE LAND" has many individually fine shots of wildlife

acles in taking the motion pictures of the climbing operations, particularly the work on the great ice fall at about 24,000 feet. Indeed, it seemed that these photographic tasks, involving heavy camera equipment and performed no doubt with a minimum of oxygen so as not to weaken the ultimate purpose, required stamina, skill, and courage almost comparable to that of the final climb itself. Above 26,000 feet, motion pictures were not possible, and airplane views give us our understanding of the topmost 3000 feet of the mountain.

If at the end of the picture you haven't had chills run up and down your spine over the dizzy ice cliffs or in response to the hurricane gales, you will have them in the sheer heart-warming impact of the

climax, which is not fully reached even in the attainment of the summit. It comes when Col. Hunt, the man who planned the assault but did not reach the top, the man who had gone without oxygen to increase the chances of the others, goes out to greet the returning climbers who made it—the tall New Zealander, Edmund P. Hillary, and the stocky native Sherpa of Nepal, Bhotia Tensing Norkey. Something greater than physical courage shines through the lonely scene when Hunt embraces these two so different persons. You feel the mountain gods bowing in approval of man's capacity for concerted effort and heroism, and you know that you are witnessing one of the greatest scenes in the history of exploration.

Song of the Land

"SONG OF THE LAND," writes Dr. Dean Amadon of the American Museum's Bird Department, "for the greater part consists of excellent movies of various forms of wildlife of western North America. Included are many superb pictures of the life history of the California Condor, made by Harrison and Pemberton."

However, the framework on which this picture is built will mean different things to different people if the reaction of the general public is anything like that of our scientific viewers. "The film," writes Dr. Amadon, "goes beyond the usual nature film, by attempting to trace an entire cycle of geological activity with regional extermination of life." Because of the use of the term "cosmic cycle" in the film, implying the entire earth, Mr. T. Donald Carter found the setting and sequence rather difficult to comprehend: "From the introduction and during the viewing of the picture I was under the impression that the entire earth was being destroyed and then built up, only to be destroyed again, and once again to be brought back to a land of living things. This sequence was rather hard for me to understand. Later I found that other witnesses of the picture were given to believe that the disturbance was of a local nature, which would then make such a sequence possible. If so, this should be more clearly stressed, for I am sure many of the people, who view this picture will feel as I did."

Geologist Frederick Pough says: "The locale of the picture is stated so ambiguously that it is difficult to criticize the geology. It is not made clear whether it is a small island or the entire world that is being considered. At times it seems to be one and then it will appear to be the other. The doctrine of Uniformitarianism, that is, of gradual evolution of earth forms by the same processes which are operating today, at the same rate that they are operating

Brief comments on films previously reviewed

Documentary and Grade A

What the Experts Said

Below the Sahara

African wildlife film made on location

Interesting sequences of African fauna and native people. Authentic flavor

The Living Desert

Disney's first feature-length True-life Adventure film, showing animal and plant life in the Great American Desert

Marvels disclosed in this film must be seen before one can sense full significance

Tanga Tika

A story attempting to portray present-day Polynesian life

Takes an anthropologist to understand fully what the film is trying to do. Beautiful photography

Down the Alphabet

Captain John Smith and Pocahontas

Unimaginative portrayal of the famous tale

A modern version of the story

Mogambo

Clark Gable as animal collector in Africa. Simple plot

Not truly Africa, although partly filmed on location. Gorilla action climax of film



◀ "WAR ARROW"—a refreshing western by Universal-International

"War Arrow"

Reviewed by ETHEL CUTLER FREEMAN

AS a western, "War Arrow" ranks high. To hold and enlarge their audiences the far-sighted producers of "War Arrow" have improved the conventional western script of one-dimensional sheriffs, gunmen, and Indians.

The story is passable and plausible, and the actors and actions believable. Howell Brady (Jeff Chandler) adequately portrays an Army Major sent by Washington to Texas to control the marauding Kiowa Indians. The tale revolves around the jealousy of the Commanding Officer, Col. Jackson Meade (John McIntire), which is aroused by pretty red-headed Elaine Corwin (Maureen O'Hara), because of her amorous interest in Brady. Suspense is increased by the introduction of a band of Seminoles and their chief, Magro (Henry Brandon), and his handsome and dynamic daughter, Avis (Susan Ball).

The picture is well directed and cast, and the color photography is good. "War Arrow" should be welcomed as an advance in westerns.

now, is a generally accepted tenet of geology, and has been for some hundred years. Locally, where volcanic processes recur at intervals over a long period of time, as in the Columbia River Plateau area, we would find such a cycle (hardly "cosmic"), with volcanic action, reap-

pearance of life, and finally more vulcanism. As it is presented here, however, it would certainly be confusing to the average viewer."

Mr. Carter found it a relief to see all the animals and birds correctly identified. This is a United Artists picture.

ASSIGNMENT AMAZON *continued from page 31*

buried to the music of the clarinet."

Clearly Orlando, in his work with the Indians, was leaving their religious philosophy alone. I mentioned that in my travels as an anthropologist, I had seen mission schools, colleges, and hospitals that I thought were of great benefit to backward people. I also said I had seen missionaries blamed for harm that had been caused by traders, trappers, prospectors, and others.

For a moment, Orlando thought deeply; then he said, "The question of the missionary is difficult. One could not deny, for example, that a missionary of good will with medical help to offer can render a good service to the Indian. In comparison with the riff-raff of the frontier—diamond prospectors, rubber men, and the like—the missionary is far superior. But when the missionary indoctrinates the Indians in regard to their spiritual and religious life, all parts of their culture are altered and a process of decay almost always sets in."

I had been worrying that this

sort of protection for the Indians might only soften them for worse exploitation in the end. "The wave of civilization will come, you know," I said. "Do you really believe that these people can rise with it instead of being drowned by it?"

It was the first time that something almost fierce came into Orlando. "It is our whole aim to save them," he said. "Naturally, they will not always have it like this. But they must not leap from their culture into ours, unless we want to see them become like the poorest laborer, miserable in spirit, afflicted with tuberculosis and intestinal parasites, and hopeless in outlook. The change must be gradual, and they must have perfect help all along."

I was ready to agree that there was a public sympathy for the Indian in Brazil not generally present in most countries. But I couldn't overlook what a heavy drain it would be on the public treasury to put into action the program of pro-

tection and education this would involve. "I'd feel better," I said, "if the Indians were producing something for civilized economy, so that they could help pay the bill."

"Ah, great progress is being made by the Indian Protection Service," said Orlando. "For example, the Indians of South Brazil in 1952 produced \$80,000 worth of wheat and \$67,500 worth of wood. The Mundurucu Indians of the state of Pará produced \$16,500 worth of rubber, and so on. In 1950, the total value of Indian production was only \$34,705. The next year, when Dr. Malcher became Director of the Indian Protection Service, it rose to \$139,789, and last year it reached \$198,716. Some Indians who were quite wild only two years ago and were killing rubber collectors are now producing."

"How about these Xingu tribes?" I asked.

"Alas, we have no natural products here to extract—no diamonds, no rubber, no Brazil nuts."

"The hammocks these Indians make are beautiful and useful," I suggested. "They could be sold in

Rio and even in the United States."

"A good idea," Orlando nodded. "And they are light enough to be shipped out by airplane. There are also fur-bearing animals—the onça and giant otter—but to take them would be contrary to the creation of a national preserve to protect the Indians and their world."

I asked more about this national preserve, and Orlando's eyes lighted. "It is the only hope for these people," he exclaimed. "All over the world there are national preserves to protect the wildlife but none to protect native peoples and their culture. This village will be the center."

I glanced around the clearing, unable to imagine how this spot beyond the edge of nowhere could become the center of anything.

"Come with me," he said, and he led me along a path through the jungle. In five minutes, we came to a perfectly leveled air field two-thirds of a mile long! He and his Indians had made it. Beyond was a vast clearing in which a spacious 63-foot hut was nearing completion.

"This will be the hub of the wheel," he went on. "Seven other air fields in different directions will give us our communication system, so that supplies, medical needs, and mail can be circulated. Several of these fields are already in good shape—all the way from Rio Verde in the west to the Rio das Mortes in the east, a distance of 300 miles, and north clear to the border of Pará. Over here will be the medical hut; there, the storage hut; and beyond, the radio hut. All around, there will be huts for visiting tribes, where they can stay while sharing their dances and other ceremonials. And while we are looking after their needs, scientists can study the culture of the various tribes so that we can find out about the origin of these people while their way of life is yet unchanged."

The little man with the bare feet and the eyes of a prophet had a big idea, and I had to admit it. But I kept wondering how he could do it with the help he could expect. He had chosen a dangerous calling.

There were still many Indians in his territory who had not yet made peace. How long would his luck hold? Besides, his own friendly Indians right here in the Kuluene region would almost certainly in some measure turn against him. I sensed already that the pleasure and opportunities of civilization were tempting them. How could one man keep the Indians from leaving a reservation so large? True, Orlando had absolute power to forbid them to go. No plane could take an Indian on board without his approval. But the ways of escape will grow more numerous. The task of educating these Stone Age people to the dangers and diseases of civilization will be expensive.

We strolled back to the village. Orlando swept his hand around and said, "All this will be burned to the ground in a few months when we finish the other buildings."

"But will the preserve really be established?" I asked.

"It must," he said. "President Vargas is in favor of it, so are other influential people in the government. It can't fail. It mustn't."

Not many hours later, I was on the long flight home—30 hours flying-time from Stone Age Jungle to 20th Century New York City. Our luxurious space ship was somewhere over the endless tangled wilderness of the Amazon north of Rio de Janeiro when the stewardess handed me an elaborate chicken dinner, with champagne. The American businessmen near me were talking about the price of cotton in Uruguay.

The sun was setting outside my porthole, and I couldn't take my eyes from a thread of smoke directly beneath us, rising straight toward heaven for half a mile in the evening air. With a flood of feeling, that ancient other world came back to me. I could hear the flutes, smell the urucú paint, feel the ground shake to the thumping sticks. The fires were crackling in the huts; the mother's were warming their babies in the hammocks. The macaws were settling themselves for the

night. I could see it all so clearly. Miles away on the horizon was another thread of smoke, weeks distant on the ground. And far back over our rudder, 500 miles away and seemingly 10,000 years ago, was that determined little man who had found the land of long ago and had but one thought—to stay there until he made the world a better place for the jungle Indians. A big order, but I hoped he would succeed.

the end



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far more readily than do leopards, for example.

When pursuing a buck, the cheetah's final burst of speed is terrific and must be in the neighborhood of 65 to 70 miles an hour for 100 yards. The cheetah is generally conceded to be the fastest animal on land.

Further information on this interesting animal can be found in an article published in the March, 1938, issue of *NATURAL HISTORY Magazine*, entitled "The Fastest Hunt in the World," by C. Suydam Cutting. A chart showing the relative speeds of various birds, fishes, mammals, and other creatures was published in the October, 1937, issue of *NATURAL HISTORY*.

Formidable Salamander

Sirs:

This incident surprised me!

A friend of mine brought me a five-inch salamander he had found under a rock pile. It was red-brown with dark spots and about the size of your finger. As I was feeding several snakes at the time, I put the salamander in the feeding pen with a 26-inch banded watersnake. This snake had just had nine little ones, and I thought she would be hungry.

At first the snake avoided the little creature, but finally she attacked it. The next twenty seconds were full of action, and the salamander suffered serious damage. But on the next go-around, when the snake finally got the salamander's head in her mouth, things began to go differently. The action became fierce, and I knew the snake was in trouble. She thrashed around the pen, spilling blood everywhere. Finally she threw the animal out of her mouth, and the fight was over.

An average-sized king snake wouldn't tackle the salamander, and a large king snake, after a brief but rugged action, got bitten in the corner of its mouth so

badly that its blood flowed freely and it gave up the fight!

Can you tell me how the salamander can defend itself so effectively?

RUSSELL S. GROVE

Marietta, Ga.

The following comments are offered by Bessie M. Hecht, Scientific Assistant in the American Museum's Department of Amphibians and Reptiles:

The sort of incident Mr. Grove relates is not often seen but is easily explained. The salamander was probably an eft, the land stage of the water newt (*Triturus*), or possibly a Red Salamander (*Pseudotriton*). In any case, it is known that many salamanders, especially the newt have a highly virulent, alkaloid poison that is produced by the glands in the skin. This poison has drastic effects on the digestive tracts of animals.

Although the teeth were apparently useful to the salamander in defending itself against its large enemy, the highly virulent skin secretion was probably more effective. So potent is this poison that the snakes had to eject the salamander soon after grasping it in their mouths.

Kindred Interests

Sirs:

I hope you will excuse this self-introductory letter. During a trip around the world, I have been fascinated by the flora and fauna of the United States and by your national parks. When I get back to India, I would like to make a comparative study of the parks and animal sanctuaries of India and Kashmir. My main interest is in photographing wildlife, to which I have devoted considerable time.

My chief reason in writing is to ask whether among the readers of *NATURAL HISTORY Magazine* there may not be some amateur naturalists who would be willing to correspond with me to exchange views. If so, I should be delighted to hear from them.

MR. A. S. TALATI

Technical Director
Rakhlkol Collieries,
P. O. Junnoodeo,
Dist. Chhindwara,
Madhya Pradesh, India

Sirs:

I am an amateur botanist who wishes to correspond with a botanist—a professor or advanced amateur—anywhere in the United States or Canada. Theme: local flora.

OTTO J. ELLIK

127 Willow Street
Brooklyn 1, N. Y.

Special Cars to Cross Sahara

Two automobiles designed especially for a west-to-east crossing of the Sahara Desert were exhibited to the public recently in front of the American Museum of Natural History. They represented the mobile equipment of Mr. Claude Bernheim, a New York businessman and formerly a pilot with the Free French Forces, who will lead the four-month ex-

pedition from Casablanca on the Atlantic Ocean to the town of Irmu at the Kenya border, then north to Cairo, a total distance of almost 15,000 miles. Approximately 4000 miles of the area between the Atlas Mountains and Irmu have rarely, if ever, been covered by a motor vehicle.

One of the automobiles, a Dodge-Power Wagon, has been equipped with a 264-gallon gasoline tank, as well as a winch, cable, and land anchor. A light canvas canopy and mosquito netting can be extended in the rear of the car to form a large room when in camp. The other car, a modified Willys Station-wagon, has been equipped with a special luggage compartment and a filming platform on the roof.

Others in the expedition include Mr. Bernheim's wife, two daughters, Daniele and Miriam, and the latter's husband, Francis Conant, writer and photographer. They sailed from New York early in December.

The expedition plans to concentrate on the Tuareg tribe, in which it is the men who veil their faces, leaving only their eyes and foreheads bare. The ethnological materials brought back by the expedition will constitute the American Museum's first important collection from this area. The expedition may also make contact with several tribes south of the Sahara.

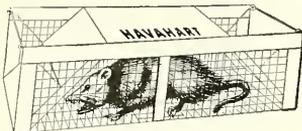
The Gilliards Return to New Guinea

The well-known bird scientist E. Thomas Gilliard, whose articles in *NATURAL HISTORY Magazine* have attracted wide interest through the years, left in the middle of last month for New Guinea in the company of his wife. Their purpose is to make the first comprehensive collection of birds of the mountains at the headquarters of the Sepik River, the least known area of New Guinea. The Sepik River rises between Netherlands New Guinea and Territory of New Guinea and flows 700 miles northeast to the Bismarck Sea.

This will be Mr. Gilliard's fifth trip to the island and his wife's second. During previous expeditions, the naturalist discovered 23 forms of birds unknown to science. The Gilliards will be accompanied by Robert Doyle, a naturalist-photographer from Bougainville Island. Aside from supplementing the Museum's bird collections, now considered the largest and finest in America, the explorers hope to photograph the natives who have been least affected by the advent of civilization and to gather things made by them for the Museum's collections.

From a base in the lower Sepik Valley, the expedition expects to work its way up to the Victor Emmanuel Mountains, a range still virtually unexplored. The Gilliards will return to this country early next June. The expedition is sponsored by the American Museum, the National Geographic Society, the C. R. Vose Exploration Fund of the Explorers Club, and the Frank M. Chapman Memorial Fund.

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Robert C. Barker



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Robert C. Barker

This typical life story was told us by a bundle of cancelled checks



NEW YORK June 12 1953 No. 121
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Robert C. Barker

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their cash from deal to deal. Debtors would be obliged to pay up in currency, creditors would have to hire money counters, and the nation's economy would wither.

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* * *

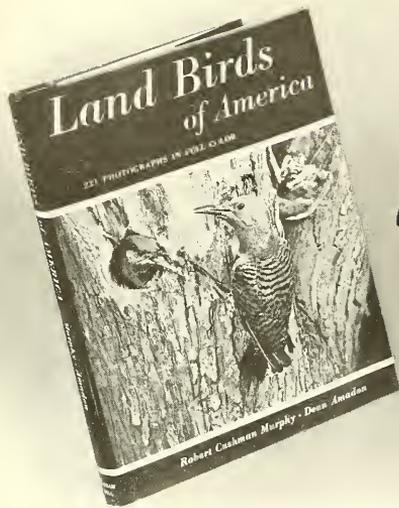
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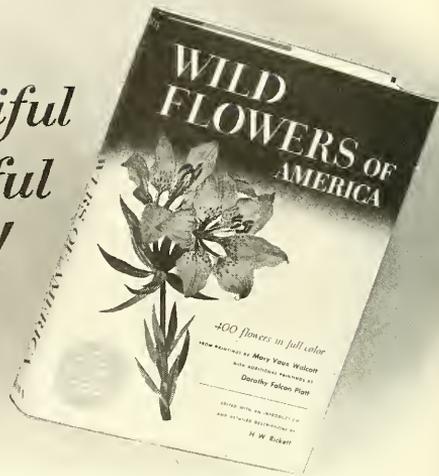
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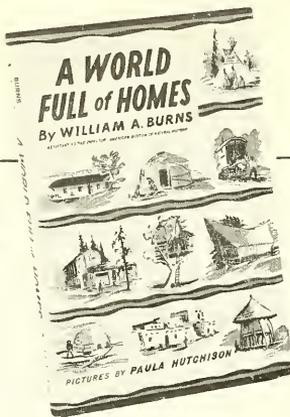
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LETTERS

Raccoons Galore

For ages man has hunted the raccoon in North America, the only continent where it is found, and it has become an extremely wary animal in most localities. Yet close to the city of Vancouver, Canada, raccoons now "hunt" Patrick and Mabel Barbour nightly, especially in winter when their natural food becomes scarcer. This marks the success of five years of patient effort by these animal-lovers to build confidence and friendship in these timid creatures.

At first the Barbours gained the trust of one raccoon. This one, they say, seems to have "told" others, until today nightly as many as 20 coons come up the steps at the front door where food is laid out for them. Only eleven were on hand the night after the first snow when the photographer's flash bulb exploded to take this picture. Note particularly how the animals' eyes reflect the glow of the flash bulb.

FRANCIS DICKIE

A Ruffed Grouse and a Kindly Caretaker

SIRS:

I am prompted to ask your experts for a scientific opinion of this happening, which impressed me greatly. We were driving through relatively wild country at Grand Island near Munising, Michigan, when the caretaker stopped the car, got out, and called, "Here little birdie, come." I almost thought he had gone out of his head, but he held up his hand for silence. Within three minutes, a hen partridge or ruffed grouse came out of the woods, took bread out of our hands, and hopped into the car for more.

It seems that the caretaker had seen the partridge about a year before in the brush about 20 feet off the road. As he walked up and down the road, the part-

ridge followed him, but never any closer than 20 feet. He saw the bird occasionally through the winter, but in May it was no friendlier than in the previous fall. However, after placing wild berries in the road for it to eat, its nervousness gradually disappeared, and within 60 days the bird would come at his call. Although the cock was frequently seen back in the woods, it never became so friendly. The hen would waddle along like a duck after the car as it pulled away and would actually try to fly up and alight on the back, unsuccessfully, of course. On several occasions, the caretaker picked her up and petted her. At any opportunity that presented itself, she would stamp her feet, rough up her neck feathers, and prepare for a fight, rushing at him and pecking at his boots. Then she would hop back, rough her feathers, and go for him again. But if his hand were extended, palm upwards, she would be friendly again.

Have these birds frequently been tamed in such a manner? Also, the caretaker would like to know what to feed her if he made a coop and took care of her during the winter.

CARTER H. HARRISON

Chicago, Ill.

The following comments are offered by Dr. John T. Zimmer of the American Museum's Bird Department:

There have been numerous reports of ruffed grouse showing a tameness at variance with the usual shy nature of the species. Some of these reports have told of birds approaching a car or tractor that had the motor running, but not when it was stopped. A possible explanation has been proposed, based on a suggested resemblance between the sound of the motor and the drumming of a male grouse. However, other instances have concerned woodcutters at work with the ax or the noise made by two sticks struck sharply together. In neither of these cases is the resemblance to a drumming grouse apparent. I have seen no adequate explanation of the birds' behavior.

The food of the ruffed grouse is extremely varied, particularly during the

summer but necessarily more limited in winter. During the latter season, the birds consume quantities of buds from trees and bushes, as well as such seeds and berries as can be found. Insect food, of course, is not obtainable to any great extent. Caged or penned birds have thrived on grain, mash rolled in the form of pellets, lettuce leaves, an occasional apple and such things, with, of course, grit. Any coop should be large enough to give the bird ample freedom of movement or should have an adjacent pen.

Desert Fish and Tufa "Castles"

SIRS:

I enjoyed Nell Murbarger's article on the big petrified tree in Nevada, because the route she and her companion took vividly recalled memories of my trek across the Black Rock Desert in 1939 in search of fish life. Living fish actually occur on the edge of that arid expanse, surviving in water at over 100 degrees F., as you may remember my mentioning in an article on desert fishes in your December, 1949, issue. I believe that Ice Age Lake Lahontan was not formed exactly by meltwater from the North American ice sheet, as Miss Murbarger intimated but rather from the increased precipitation that was correlated with the existence of the continental glaciers in eastern North America and from the local formation of valley glaciers in favorable places in Nevada and California. The tufa "castles"

NOTICE — Readers are encouraged to submit their own photographs of natural history subjects. Those selected for publication on these pages will be paid for at \$3.00 each, with full credit to the photographer. Return postage must be included.

about Pyramid Lake and elsewhere, especially at the Pinnacles in Searles Dry Lake in eastern California, are very impressive and unusual, as she indicated. They are so unique, in fact, that a move has been made to protect and preserve the examples in the Searles Basin. The true nature of these interesting formations is not generally known, and it is perhaps oversimplifying matters to say that they were "deposited by the mineral-laden waters of the shrinking lake." They are built up through the activities of tiny blue-green algae, which deposit the calcium carbonate present in the waters of these ancient lakes. The conservation of

such natural wonders is worthy of encouragement and support.

ROBERT R. MILLER
Associate Curator of Fishes
University of Michigan,
Ann Arbor, Mich.

Fossil Hunter's Bonanza

A find of major importance to the whole study of prehistoric animal life, including the discovery of at least nine fossil skulls of the tiny prehistoric horse *Eohippus*, was recently made by an American Museum of Natural History expedition working in the Huerfano Valley, northwest of Walsenburg, Colorado. It promises to be the richest single source of mammals of

the early Eocene epoch, according to Dr. George Gaylord Simpson, Chairman of the Museum's Department of Geology and Paleontology. In the geologic time scale the early Eocene dates from about 50 to 60 million years ago.

The site of the excavation was originally discovered in 1952 by Mr. George O. Whitaker, a preparator in the American Museum's Department of Geology and Paleontology. In June of this year, Mr. Whitaker returned to the spot with Mr. Joseph A. Nocer, also a preparator at the Museum. Several months of work enabled them partially to complete the excavation, but numerous fossils still remain in the hillsides.

The site has been named the Castillo Pocket after its owner, Moises Castillo. It has already yielded about 20 well-preserved skulls, several complete skeletons, and numerous more fragmentary specimens. The bones are so thick in the rock that in order to avoid damaging them in the field many were taken out in a single block weighing about two tons. This block has been opened in the fossil vertebrate laboratory at the Museum, but the painstaking process of removing the bones from the rock without injury may take several years.

"Full identification must await completion of study in the Museum," Dr. Simpson added, "but we already know that at least eight different kinds of early mammals are represented in the quarry. Many more will probably be found. Concentrations of fossils often include only one or two species. This discovery is therefore of unusual interest. It gives a picture of a whole assemblage of animals that lived together early in the Age of Mammals."

Commenting on the tiny Dawn Horse, Dr. Simpson said, "Previously we had only a few skulls of this most famous of all prehistoric animals, and all of them were quite imperfect. This excavation has yielded at least nine practically perfect ones, which will greatly improve our knowledge of the earliest known horse."

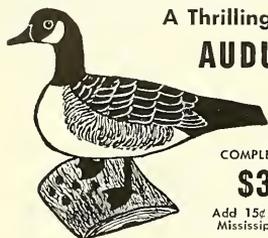
Eohippus was a small animal ranging in size from ten inches high at the shoulders to approximately half the size of a Shetland pony. It had progressed far enough along the evolutionary scale to have lost its fifth toe, to show some of the beginnings of the characteristic equine tooth structure, and to have developed a herbivorous diet. It still retained, however, some of the characteristics of the primitive mammals such as a very simple brain, multiple toes on each foot, and a long, stout tail.

Until the present group of *Eohippus* skulls was unearthed, paleontologists were not sure whether variations noted in previously discovered specimens were differences within one species or the distinguishing characteristics of several species. The excavation of this group of nine skulls has given science a basis for comparison on which to make judgments about this range of variation.

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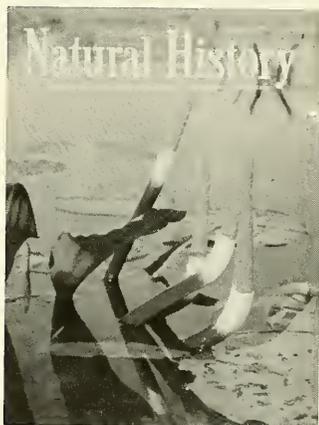
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You will find NATURAL HISTORY Magazine indexed in Reader's Guide to Periodical Literature in your library



THE COVER THIS MONTH

The so-called Never-wet is reproduced here in all its brilliance from a color photograph taken by Robert E. Gerlach, of Denver, Colorado. The plant is native only to sandy, muddy, or peaty shores and shallow waters of eastern and southern United States. Mr. Gerlach took his picture in the Okefenokee Swamp of southern Georgia. This aquatic perennial is an early spring bloomer. Its scientific name, *Orontium aquaticum* L., is said to have belonged to some plant growing in the Orontes River in Syria. It is commonly called Golden Club. Other names are Floating Arum, Water-dock, and tawkin.

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• Ways of Mammals

In Fact and Fancy

by CLIFFORD B. MOORE

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Watercolors by Andrey Avinoff

Univ. of Pittsburgh Press
2 Vols. \$60.00 per set

Vol. 1, pp. i-lxxv, 1-574, Descriptive Text;
Vol. 2, i-xvi, Plates 1-200

THE literature of botany and horticulture is extensive and includes works that combine the scholarship of authoritative research and the skill of a competent artist or photographer to produce a well-balanced treatment of the subject, but one will have difficulty in finding in this list anything to equal these impressive volumes from the University of Pittsburgh Press.

The two individuals most directly responsible for the contents have the weight of experience and authority back of their expression of ideas. Fifty-five years in field and laboratory prepared Dr. Jennings for writing the text, and to this he has added the data derived from a great number of collectors and botanical authorities. The reader notes that every effort has been made to canvass the entire field of study and to bring into the text all the significant data.

The introductory chapters deal with the early botanical studies of the region, the geology and soils, topography, climate, and plant geography. There is a key to families, a bibliography, and a glossary. The descriptive treatment of the plants, in taxonomic sequence, occupies the greater part of Volume One. One hundred forty-six maps deal with the distribution of selected species. The systematic section is phrased for the botanist rather than the lay reader.

The second volume is given over to the splendid reproductions in color of the two hundred superb water-color paintings of Dr. Avinoff. These paintings have a fidelity to nature, which in no way conflicts with a fine artistic appreciation of the beauty of the subject. Only an artist with an exceptional competence and scientific background could achieve such a result. The publisher has been so successful in the execution of the color plates that the reproductions have all the appearance of original water colors. Each plate has a brief accompanying text, and in many instances the second volume is adequate for an identification without recourse to Volume One.

No brief review can do justice to this majestic publication, which is surely destined to stand on an exalted pedestal for years to come and will be a collector's item in the not too distant future.

HAROLD E. ANTHONY

SCIENCE IN PROGRESS. EIGHTH SERIES

----- edited by George A. Baitsell

Yale University Press, \$6.00
285 pp., 103 illus.

THIS volume continues biennial publication of the Sigma Xi National Lectures, which range over all fields of the sciences and are delivered to scientific audiences generally unfamiliar with the particular specialty of the lecturer. They discuss the most recent developments without pulling any punches but with, as a rule, sufficient explanation of technical points. The eighth volume maintains the very high standard of the whole series. It is composed of ten lectures: Gamow on the evolution of the universe (no less!), Roberts on the sun's atmosphere, Kaplan on our own atmosphere, Carpenter on the evolution of insects, Watson on the South African “men-apes,” Griffin on orientation in animals, Burkholder on interactions in “primitive” (i.e., comparatively simple) organisms, Harvey on luminescent organisms, Townes on microwave spectroscopy, and Scatchard on protein solutions. Here is something for almost anyone. Reduced emphasis on physics seems to the reviewer a pleasant change and hopeful sign.

—G. C. S.

CIRCLE OF THE SEASONS

----- by Edwin Way Teale

Dodd, Mead & Co., \$4.00
306 pp.

IN *North with the Spring* Edwin Way Teale maintained pace with that charming season in its day-by-day progressive penetration of the country between Florida, the starting point, and the near summit of Mt. Washington, the ultimate goal. Where spring went, there went he.

The present book calls for a different technique, for the seasons in their circuit lose continuity when one travels far from a single site. One must stay put and await each season, or at least restrict the circumference of one's observations. To the delight of many a reader who has come to know Teale's *Insect Garden*, the *Lincoln Tree*, *Milburn Pond*, and other foci of his home environment through earlier books, notably *Near Horizons*, the setting of the present book is the country in and about Teale's place of abode on Long Island. Rarely does he stray even as far as New York City or the New Jersey shore, or wander reminiscently to the scene of earlier experiences.

The book is arranged chronologically,

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covering dated day by dated day from January 1 to December 31. Observations and reflections are delightfully blended by one who lives with nature, is alert to its happenings, and has absorbed its wisdom. The daily jottings are sometimes very brief, sometimes expanded into short essays. In the aggregate they give an integrated picture of the year's happenings, including standardized sequences but also touching on occurrences that few have been able to share,—such as a successful encounter with the black rail, “probably the most difficult bird in North America to observe in life.”

Teale is the eager inquirer, on the watch for the new as well as the old, and tireless in attempting by persistent field study to give the correct answer to puzzling questions,—witness his efforts to

ascertain whether dragonflies can fly backward. He is also the expert field photographer. The 24 full-page illustrations that adorn the volume are superb examples of technical know-how.

HERBERT F. SCHWARZ

A FIELD GUIDE TO ROCKS AND MINERALS

----- by Frederick H. Pough

Houghton Mifflin Co., \$3.75
338 pp., 44 plates

OTHER field guides to minerals have been written, but this one is by far the best. It was written primarily for the large and rapidly expanding fraternity of amateur mineralogists and collectors, but the professional mineralogist and geologist will find it a handy field manual. The author's experience as a museum curator of one of the world's most famous collections makes him a “natural” to write such a guide.

The book introduces some new twists to mineral guides. The professional mineralogist makes a great deal of use of mineral associations in mineral identification. The author emphasizes this feature in species determination. He also stresses the use of crystal form in mineral identification. Unfortunately, as he remarks, many find crystallography a difficult subject, and I am afraid that the brief light pages he devotes to it do not greatly simplify it, but the student would do well to master it. He has, furthermore, revived the old art of blowpiping and has added a number of new and novel tests. The amateur should find this art a good pastime when field collecting is out.

Two hundred and fifty species are described in detail, and another 167 species or varieties are mentioned in the text. The forty-four plates, twelve in color, are an important feature of the book. The author states in his preface that the illustrations are typical of the specimens that the amateur may find himself. The amateur stands as good a chance to find an outstanding museum specimen as the professional, and frequently does.

The price of the book is reasonable, and every amateur mineralogist will find it useful.

W. F. FOSHAG

TAHITI. VOYAGE THROUGH PARADISE

----- by George T. Eggleston

The Devin-Adair Company, \$6.00
252 pp., 105 illus.

GEORGE T. EGGLESTON, an editor of the *Reader's Digest*, with his wife, Hazel, took a trip to Tahiti several years ago with the purpose of cruising through the Society Islands in a small yacht, if they could find one there. They did, and they carried out the plan of visiting Tahiti's sister islands, ending up at Rarotonga in the Cook Islands, somewhat south of the Society group.

Mr. Eggleston was lucky enough to

find the 32-foot *Viator* in Tahiti and to discover its owner, Harry Close, eager to make the same circuit. Joining forces, their cruise took them to Moorea, Huahine, Raiatea, Tahaa, Borabora, Tubai, Maupiti, and Mopeli—all lovely islands out of the track of the tourists and still retaining much of the old charm of the life of these islands. Although Mr. Eggleston nowhere gives the exact date of his trip, the islands change so little that dates are hardly necessary.

The account of the trip is charming and bound to be nostalgic to anyone who has covered the same ground. It is necessarily one of first impressions, since the voyagers hardly had time to probe very deeply into the life of the natives. But what they saw and experienced is a valid side of the life that the traveler sees in these beautiful islands.

Not the least of the charm of this log are the excellent photographs, which are grouped in a generous appendix.

HARRY L. SHAPIRO

FLOWERS OF THE SOUTHWEST MESAS

----- by Pauline M. Patraw

FLOWERS OF THE SOUTHWEST DESERTS

----- by Natt N. Dodge

FLOWERS OF THE SOUTHWEST MOUNTAINS

----- by Leslie P. Arnberger

Southwestern Monuments Association,
Santa Fe, New Mexico, \$1.00 each.

THESE attractive, paper-covered volumes may be reviewed as a package because most of the complimentary remarks to be made will apply equally well to any one of the three. They are published by the Southwestern Monuments Association to serve as field manuals for visitors to the National Monuments of New Mexico and Arizona. They accomplish this purpose most successfully, but they have too much merit and usefulness to be restricted only to those persons who are lucky enough to visit a Monument and see one of these books offered for sale. They deserve to be better known and to be made available to a wider circle of nature lovers.

It is true that these books are planned to have their most immediate application to a local area, but many facts are given in the text or in the illustrations which can be put to use in regions outside of the Southwest. Furthermore, the individual who cares for flowers and loves the out-of-doors can get a vicarious lift from leafing over these booklets, recalling a visit to the Southwest or looking forward to that pleasure yet to come.

The treatment of the plants is by a simple scheme of color separation, the flowers grouped under white, pinkish, yellow, et cetera, and then the identification and pertinent comments are given. The illustrations are by Jeanne R. Janish,

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who makes excellent line drawings, which carry either a foot ruler or the symbol of a human figure for the basis of comparison.

These books can be recommended without reservation for immediate use in the Southwest or for the plant lover's library anywhere.

HAROLD E. ANTHONY

REPTILES AND AMPHIBIANS. A GUIDE TO FAMILIAR AMERICAN SPECIES

----- by Herbert S. Zim
and Hobart N. Smith
Simon and Schuster, \$1.50
157 pp.

PREVIOUSLY published volumes in this Golden Nature Guide Series deal with stars, trees, flowers, insects, and birds. Along with the present one they represent an effort to provide illustrations in color so that the amateur can identify what he sees by consulting the plates and the distributional maps. Only the plants or animals commonly seen in the United States are depicted.

The general idea is excellent. Colored plates, which ordinarily add so much to the cost of a book, understandably are not of top quality in this most recent volume. The text is elementary, not to say simple. All scientific names are meticulously avoided. A few incorrect statements have crept in, but the text is, for the most part, factually correct. The beginner will find that color, however inadequate, does add to the interest of the book. With more time and effort devoted to selecting and condensing the information to be included, this could have been a topnotch book for the beginner.

C. M. BOBERT

SONGBIRDS IN YOUR GARDEN

----- by John K. Terres
Thomas Y. Crowell, \$3.95
274 pp., 25 illus.

THIS BOOK thoroughly goes into the methods of attracting birds to suburban gardens and lawns. How to build and place bird houses, bird feeders, and bird baths; what fruit-bearing shrubs to plant in each part of the United States; how to care for orphaned baby birds; these are but a few of the many topics discussed. A long appendix contains all sorts of practical information for the bird lover—how to mix bird seeds for the requirements of different finches; where to secure pamphlets on shrubs and ornamentals; what flowers are attractive to hummingbirds, and so forth.

In his capacity as managing editor of *Audubon Magazine* the author of *Songbirds in Your Garden* has had a unique opportunity to learn his subject. His book is enlivened by numerous anecdotes, such as the use on a Virginia plantation of bleached cow skulls as "nest boxes" for vrens. This has a macabre tone but is balanced by several stories that are, if anything, too sugary. All in all, however, Terres has written a very useful encyclo-

pedia for attracting birds. The colored frontispiece, one of Audubon's lesser known paintings, is a stunner. There are also ornamental and instructive line cuts by H. B. Kane.

DEAN AMADON

HAMMOND'S GUIDE TO NATURE HOBBIES

----- by E. L. Jordan
C. S. Hammond and Co., \$2.95
64 pp., 63 illus.

THE *Hammond's Guide to Nature Hobbies* is bound to arouse an interest in natural history and to put that interest to work at one or several pleasant avocations. There are hundreds of suggestions about collecting, identifying, and storing specimens. There are directions for publishing projects of all sorts—birdhouses, terrariums, aquariums, and other useful items, and, most important of all, there are many references to more specific and detailed information.

The illustrations in this book do not always seem to be placed to best advantage. Those of plants are found in the chapter on shells, birdhouses are shown in the chapter on aquariums, and some on insect collecting are in the chapter on birds.

The content of the book is excellent and reliable, and the drawings are good and self-explanatory. It is to be highly recommended to all amateur naturalists and to every teacher of natural history.

WILLIAM J. SCHWARTING

THE MONKEY BOOK

----- by Ernest J. Walker
Macmillan Co.
153 pp., 52 illus.

THIS BOOK is a well-prepared presentation of data on the Primates, the type of knowledge one wants to know if he contemplates having a monkey as a pet. The text is instructive for any nature lover, but the over-all purpose is to prepare the reader for a wise selection of the particular primate he should secure, what he may expect to pay for it, what it needs in the way of food, its health requirements, and its survival factor.

Not many people are so situated that they may adopt a monkey as a member of the household: this animal does not adapt itself as readily as a dog or a cat to the environment of human habitations in temperate regions. Depending upon the size and behavior of the monkey, it may be an inmate within the house or it may require a special structure, a cage, with all that may mean in heating, lighting, cleaning, et cetera.

The temperaments of the various monkeys, and a great many are discussed in this book, run the gamut from bright, alert activity during daylight to slumber and lethargy by day alternating with activity that rises to a peak when the average household is asleep. In general, it is advisable to get your monkey at an early age. Youngsters make friends more easily have fewer fixed habits, and can be conditioned to a new environment more readily. With some species, maturity

brings strength and incompatibility with human companionship, and the monkey can not be trusted with full freedom.

The author writes from extensive experience with monkeys in captivity, and his opinions and advice have the stamp of authority.

The illustrations are a helpful supplement to the text. From these the reader who may contemplate bringing a monkey into his home can select the particular model to suit his entourage.

HAROLD E. ANTHONY

SCIENTIFIC AMERICAN READER

by the Editors of Scientific American
Simon and Schuster, \$6.00
626 pp.

THIS substantial book, 626 pages of text, covers a wide range of subjects and presents the current thought on a number of topics of interest to the average reader.

It is not possible within the limits of this brief review to do much more than run over the major headings, which are as follows: Evolution in Space, Structures of the Earth, Structure of Matter, Atomic Energy, Origin of Life, Genetics, The Virus, Stress, Animal Behavior, Origin of Man, The Brain and the Machine, Sensation and Perception. Some 50 writers have contributed and among these are many whose opinions carry the weight of recognized authority. It is very convenient to have within the confines of a single volume such a contribution to a better understanding of the material universe in which man exists and to which animal behavior is conditioned. Such a complex field calls for expositions and philosophies on different intelligence levels. Obviously it needs a higher I.Q. to penetrate "The aura of enigmatic omniscience that cloaks our atomic projects," (quoted from the Introduction to Atomic Energy) than to follow "Mapping the surface, charting the ocean floors and probing the opaque crust" (Introduction to Structure of the Earth). But let no one conclude from this that any part of this book expounds science at the level of the primary grades. The conclusions are profound and sometimes challenging. The lay reader will gain considerable knowledge from this text, but he will get more in direct proportion to his grounding in the terminology and concepts of present-day science.

This is an excellent book to own, to read and digest at leisure, and to reread and study as events in the daily press send one to a sound reference for a review.

HAROLD E. ANTHONY

Correction

In reviewing the American edition of Miss Erna Pinner's book entitled *Curious Creatures* (Nov., 1953), we incorrectly ascribed the text to Dr. W. E. Swinton, with whom Miss Pinner had previously produced another book. Miss Pinner is the author of *Curious Creatures* as well as its artist. The English edition of this book, reviewed in April, 1952, ascribed the authorship to her correctly.

IT was on August 1, 1952, that the men on the tuna boat "Challenger" raised anchor on the west side of San Benedicto Island, 350 miles west of Mexico in the Pacific. They started fishing as usual, little realizing that on the opposite side of the island a strange event was soon to take place in a small cove. Before an hour had passed a tiny puff of white smoke ascended skyward from this cove and in a matter of minutes the wisp had become a sizable cloud of black ash-laden steam. Dust and pumice fragments began to fall on the decks and the sky became dark. The fishermen frantically steered the ship away from the holocaust at full speed.

Although these departing fishermen did not know it at the time, geological history was being made. For despite the thousands of vol-

OPERATION

Cremation

A personal account

of the dramatic first landing on a new volcano in the Pacific and the descent into its crater

By **ADRIAN F. RICHARDS** and **LEWIS WAYNE WALKER**

Photographs by the authors unless otherwise credited

canic cones that dot every sea and continent around the world, there are only about a dozen that have been observed in historical times

to progress from the throes of birth to maturity.

Late that night and 40 miles away, the men found another

▼ **BOQUERÓN** in action on September 12. Note the absence of any beach in the foreground. With continuous heavy surf, landing was difficult. The cone is 1250

feet high. Furrows on it are believed to have been caused by down-rushing incandescent gases such as caused the death of 30,000 persons in the eruption of Mt. Pelée

Official Photograph U. S. Navy





Official Photograph U. S. Navy

▲ A MOSAIC AERIAL PHOTOGRAPH of the island from an altitude of 10,000 feet. Note the fan-shaped flow of lava that poured from the base of the cone into the sea at upper right



anchorage, on Soccoro, largest of the four islands forming the Revillagigedo group. The dawn watch reported towering columns of smoke on the horizon.

A mixture of curiosity and caution gripped the crew. Some, perhaps, remembered a bit of their schoolroom history of Krakatoa, the island volcano that committed suicide in 1883 in the mightiest explosion known to man. It destroyed its cone in a matter of minutes and eliminated its insular foundation to a depth of 1000 feet below sea level. Tidal waves snuffed out the lives of 36,000 people, and the dust that was sent into the stratosphere gave the world four years of incomparable sunsets.

Two weeks later, the "Intrepid," another craft of the fishing fleet, visited the island and found the height of the new volcano to be approximately 1000 feet above sea

level near where the "Challenger" had been anchored during the volcano's birth. Such phenomenal growth almost established a record for strenuous activity in extruding and depositing material from the earth's core in a short period of time.

During the volcano's first fourteen days of growth, untold thousands of tons of pumice were ejected, to cover and smother all living things on the southern, or lee end of the island. Some of this pumice, thrown beyond the shore, settled to the bottom. There, due to its porous nature, it now gives a peculiar double depth reading on the charts of fathometers in some areas. More buoyant bits of it, however, formed into tremendous rafts. One of these, seemingly stretching from horizon to horizon, was seen to be serenely floating across the Pacific 300 miles from its point of origin.

About one month after the "Intrepid's" observations, a photographic flight over the island disclosed billowing masses of smoke. Photographs taken on this trip showed many vertical grooves on the outer wall of the crater. Most of these were probably caused by heavy rains, which in turn were caused by the condensation of volcanic moisture on volcanic dust. At one spot, however, where the rim of the crater dipped to form a natural spillway, some of these vertical troughs had rounded bottoms and lacked the customary indentations from tributary drainage trickles. Volcanologists toyed with the possibility that these had been caused by the heavy, white-hot gases called *nuées ardentes* such as cascaded from Mt. Pélee and swept through the village of St. Pierre, killing 30,000 inhabitants.

It was not only the origin of the

grooves that had the experts guessing about El Boquerón, or "The Big Mouth," as the crater had been named. Scores of other things interested them, such as changes in the ocean floor and sounds that might be picked up by delicate instruments hundreds or thousands of miles away. In short, interest in the volcano grew rapidly both in scientific and popular circles and as a result reconnaissance flights over the area were made by men of the University of California, the Navy Electronics Laboratory, and the Air Force. Their observations, combined with those made by various boats of the tuna fleet, have given a remarkably complete calendar of events.

A flight eight days later reported a distinct cessation of activity. It then seemed from the photographic evidence on hand that a small lava plug deposited 700 feet down inside the crater's rim prior to the second flight was successfully blocking the volcano's throat.

The authors, feeling that El Boquerón was probably on its way to relative obscurity, made extensive plans for the first beach landing. It was our hope to descend toward the plug as far as the heat would permit. We also hoped to examine the problematical gas grooves that had the experts guessing, before erosion might destroy their natural contours. However, the apparent dormancy was misleading, for then came the report of November 12, when flames from the depths flickered over the rim.

Three days later, a Navy PBM reported that a mass of hot black lava had risen 350 feet within the crater, forming a tremendous, fairly flat floor, estimated to be one-quarter of a mile in diameter. Although incandescence was not reported, these manifestations all belied our prophecy of the volcano's demise. However, plans were too well laid to be scrapped at this late date. Definite arrangements had been made for us to be left on the beach and picked up a few



▲ A VIEW OF EL BOQUERÓN ("The Big Mouth") from the southern end of San Benedicto Island

days later. From past experience it had been demonstrated that the cooperation generated by enthusiasm has a relatively short life, so we decided to hit while the iron was hot, even though the crater might be hot too.

Three days after leaving Southern California on Woodrow Krieger's yacht "Observer," the radio buzzed with volcanic information. Every few minutes, one of the seven tuna boats drifting near El Boquerón would break in with "landslides on the south wall,"—"smoke pouring forth 100 feet above the beach line,"—"more landslides,"—"now lava blocks are tumbling to the beach, and as the waves hit them clouds of steam rise in the air."

In the hours preceding dawn, the red glow of these tumbling rocks stole the spotlight, and descriptions of a weird beauty, printable and otherwise, came to us as we pushed across the intervening 100 miles. Thoughts of dormancy either for us or the volcano, were forgotten. If El Boquerón were to blow its top, we wanted to be there for the show; if not, we wanted to

explore what we could before this new activity made any radical changes in the crater's symmetrical structure.

Well before San Benedicto appeared, we became aware of its presence by wispy clouds, all emanating above one point on the horizon. These were not the masses of gas and dust we expected to see blown from El Boquerón. They were instead the sudden condensation of a hot pillar of moisture-laden air, only visible when chilled by the cooler atmosphere of the high altitudes. An hour or so later, cauliflower puffs appeared, and then the rugged peaks of the island came into view.

The volcano's latest manifestation of power, which had kept radios busy throughout the night, could be seen at the base of the cone in the form of a tremendous fan of smouldering lava. Curls of sulphuric steam rose from the main mass, and its advancing edge was bordered by pillars of steam rising 100 feet into the air. This was a force that no one present had imagined—an activity that the radio

accounts in Portuguese, Italian, and English fell far short of describing. Blocks of orange-hot lava the size of an ordinary living room had been squeezed through a narrow opening, piled from 60 to 100 feet deep, and then, as though pushed by a tremendous bulldozer, forced inexorably into the ocean. Every few minutes, one of the great blocks would teeter at the leading edge and tumble into the pounding surf, engulfed in a cloud of hissing steam.

For twenty hours from the initial break-through, this had been the pattern. The advancing wall was almost a thousand feet across at its leading edge, and it stood 700 feet

seaward from its point of origin on the crater's sloping side. Yet we could see only the surface. The part already hidden beneath the waves and sloping into the ocean depth would have an even greater bulk.

Throughout the hours that had passed and for the next four days of our visit, and for many more, the roar of a twelve-foot surf was muted by the whine of steam, as the Pacific boiled at this searing intrusion. Blocks 20 feet through, caught in the pressure of this slow-moving horizontal avalanche, cracked and shattered. But it was sight alone that told us of these happenings, for all minor noises

were effectively smothered by the fierce battle raging near by between the earth's fire and the ocean's water.

After our skiff returned to the quiet of the "Observer" a half-mile offshore, we viewed the stretch of beach to the north of the lava extrusion and came to the conclusion that it was the only spot on the entire island where the waves were moderate and where there was a gradual ascent to the crater's rim. We decided to try to land here but were forced almost immediately to abandon the idea, for landslides began sweeping over our proposed path, leaving trickles of steam pouring from the ground at

▼ AN AERIAL VIEW, showing how Boquerón looked on September 20, after the initial explosive phase. The size of the crater tells why the volcano was named "Big

Mouth." Extinct Herrera Crater is seen at left. It contains water deposited through condensation from the steam that erupted from Boquerón

Official Photograph U. S. Navy





◀ THE LAVA DELTA visible in one of the earlier aerial photographs. The dark areas on the sea cliffs are due to recent landslides. (Photographed from the yacht "Observer")

▼ THE BREAK-THROUGH not far above the sea, from which hot lava poured into the water. Note the white steam at the edge of the lava. Dark sulphurous vapors issued higher up where the material emerged



their point of origin. The thought of being trapped on a narrow beach, backed by a 200-foot cliff, with advancing lava flows at each end was far from inviting. We chose, instead, a rugged, unprotected spot to the south for our initial assault through the breakers.

At this writing, only Eddie Naponelli has the honor of landing a boat at the base of Boquerón right side up and comparatively dry! Just how he managed to get us there, in the light of future events, will always remain a mystery, and since he never tried it again, there were some who intimated that luck might have played a part. Just outside the breaker lines, the bow of our small dinghy was pointed to sea in the approved seafaring man-

ner and we inched our way in, stern first, waiting for the fabled seven big ones to pass and give us a few seconds of relative calm. That, however, was wishful thinking. One roller after another passed beneath us, rose to a crest, and crashed a stone's throw away. Then suddenly we were on a crest, precariously balanced, surfing in to the shore.

Our companions on the "Observer," watching with high-powered glasses, applauded the maneuver and freely gave Eddie the honor due a good boatman. Whether it was luck, skill, or a combination, we certainly could have used some of it a day later.

The 75-foot cliff that backed the beach was ascended in short stages,

and then came the tiring climb to the rim of the crater. Each step on this dusty ash was treacherous. On several occasions, we climbed ten feet only to slide back fifteen. Deep gulleys had been cut by the rains, and the soil was totally devoid of roots or other binding. Whirlwinds, or dust devils, were everywhere and when they headed in our direction we were forced to shut eyes and hang on until they passed over and dropped their suspended load in the ocean.

Finally as we neared the crater's ridge, a new noise struck our ears, much like rain on a tin roof. But as we went over the rim and down into the crater, the loudest sustained roar any of us had ever heard completely smothered this.



▲ THE LAVA DELTA from the southern beach. The lava averaged over 50 feet high



Three hundred feet below us at the bottom of the steeply sloping walls, we looked down at a perfect circle, one-quarter of a mile in diameter. At the center was a hole, which even in bright sunlight glowed with red incandescence. For several hundred feet around this throat, the black lava shimmered with heat waves and gave off small wisps of smoke or gas. At its edges, there was an abrupt slope downward, which gave it the effect of extending far beneath the crater's floor. Encircling this black plug there was a peculiar depression, almost moatlake in appearance. Outside of that and almost to the crater wall there was a jumble of rock, slightly lighter in color and flecked here and there with yellow crusts, which proved to be sulphur. Everything about this wide outside ring denoted upheaval, not necessarily fast or explosive, but steady and inexorable.

As we peered into this cauldron, occasionally getting blasts of oven-hot air, we let our imaginations run and could almost visualize the black lava plug lifting 350 feet as it had in the so recent past. We could see the flat floor of the crater cracking, buckling, and lifting 50-ton boulders on end to make room for this extruding cork to the magma chamber below. We also

tried to picture the pressurized upheaval that constructed this tremendous amphitheater and then threw glowing boulders hundreds of feet into the air, which were "the size of boat cabins" according to the tuna crews, who had watched them hurtle back into the depression within the crater walls.

Just as we were ready to forget speculation as to what had happened and instead explore and record the amazing scene of the present, brilliant white steam began to pour from the moat of the lava plug. Before this gas eruption ceased a minute or two later, it had formed a semi-circle about one-third of the way around this black area and had climbed as a billowing mass several hundred feet above the rim on which we were standing.

The sulphurous gas enveloping us was extremely irritating to the eyes and lungs, and we crouched on the ground waiting for the air to clear. One of us compared what we had just witnessed to a steaming kettle tilting its lid to relieve internal pressure. This was a fantastic thought, entirely unscientific, but somewhere beneath that plug there were escape valves, which released gas intermittently. There was one for the white steam, which we had just seen in action, and one for the

black steam, which surprised us a half hour later when it roared from the incandescent red throat at the center.

On the day of our arrival, a downward slippage of the entire crater wall could be seen above the break-through where lava was spilling into the sea. From the boat, the sagging of this 1000-foot-area had seemed of minor importance, but now, on the top with a companion near by to give size comparison, it assumed a foreboding appearance. In place of the two- or three-foot displacement expected, we found the whole section had dropped over twelve feet. And even as we climbed down the fault to the sliding area, small trickles of ash and tiny landslides gave proof that the motion had not yet come to rest. This section of the crater was slowly having its foundation eaten away by the seaward extrusion of the mammoth lava blocks directly below us.

On the far side of this sagging area, the strange grooves that had aroused so much interest awaited investigation. But then from the interior of the crater the constant roar, which was similar to a squadron of jet airplanes, rose to a higher pitch. Black ash-laden steam poured from the incandescent-lipped hole in the center of the

plug, expelled under such pressure that it shot above the crater walls and skyward in a dense mass that blacked out the sun. The irritating white steam had been bad enough! By comparison, this looked deadly, and we sprinted through the ankle-deep dust, away from the grooves we so much wanted to investigate. We didn't pause for breath until the wind was in our favor.

This eruption of smoke stopped as abruptly as it had appeared, but by that time we were on the west rim, with the clean, cold air from the sea at our backs. Below us an erosion-etched ravine offered a route to the bottom of the cauldron, and after a series of twenty-foot slides and numerous falls, we arrived at a ledge for a slight rest.

Yellow sulphur-incrusted rocks, which had been upended by the rise of the plug, were at eye level. Slightly above them, the domed firepit of the volcano released heat waves that shimmered and miraged the crater's distant wall. Small fumeroles, marked by escaping gases, were spread at random over the floor. From this vantage point we were able to locate the main source of the jet noise.

A space of about 100 feet separated the southern edge of the lava plug from a pile of six or eight tremendous rocks. These also were upended, and they stood in a rough circle, with their tops leaning together to form an opening in the center. Wisps of steam curled from their bases, clung to the rough sides, and were then drawn into an invisible shaft of pressurized vapor and shot into the air.

There were times during our observations when the escape of visible steam from El Boquerón was almost negligible, but the jet noise was constant. It was unseen at its source, but if we looked up, during these periods of lessened gaseous activity, a slight condensation of vapor could be detected far above the rim of the crater. This increased in density as it drifted away from the main thermal and reached cloud proportions by the time it canopied above the beach.



▲ RICHARDS AND NAPONELLI on the rim of the crater. Note how the rim dips in the background. It has apparently slumped owing to the emergence of lava near the base far below this point.

As a billowing mass, these clouds had the appearance of water vapor. But the temperatures and pressures necessary to superheat steam and carry it as an invisible column several hundred feet into the air are almost inconceivable. Red glows of incandescence that we saw within the crater were estimated to be about 1000 degrees F., but on our return to Scripps Institution of Oceanography, where a library of information on El Boquerón is being assembled, we found that the orange-white glow at the throat of the delta at night could run as high as 2400 degrees F. How wrong we were less than a month before when we felt that El Boquerón was on its last legs—just a volcano cooling down on its way to oblivion.

Forty feet below our ledge, great areas of gas-deposited sulphur coated the rocks. As mineral specimens for analysis were essential, one of us slid to the bottom of the outside moat, lowest point in the scalding amphitheater. The camera had been set for an estimated distance, and the exposures, both for

color and black and white film, had been figured in advance. Pieces of sulphur-covered lava so hot that the yellow coating was sticky were hurriedly tossed out of the moat. Then, the half-baked collector, lifting one hot foot after another, jammed the tripod legs into the ash and shot pictures at random. Thirty seconds later at a higher and cooler altitude, a breeze was sought to chill the soles of barbecued feet and to cool the rock specimens, which we had juggled up part of the hill with a skill born of desperation.

Twelve hundred feet below, the dinghy awaited us on the beach, and we descended. After tying the wrapped cameras, a charred tripod, and other equipment to the seats, we pushed Eddie's boat through a six-foot breaker and wished him luck. A few moments later we swam through the surf and let him fish us out of the Pacific beyond that first treacherous line of waves—thus officially ending El Boquerón's first assault by land.

The "Observer's" schedule called

for extensive scientific research on the Galápagos Islands, and with time running short, they were forced to conclude their part of Operation Cremation. The two of us, however, were just getting warmed up, both literally and figuratively, and wanted to continue observations and return to San Diego at a later date on one of the many tuna boats fishing in the region. However, had we been able

to foretell the events of the next 24 hours, we might not have requested aid from the fishing fleet, for unbeknown to us, our time, too, was running short.

Within minutes after our message was broadcast to near-by fishermen, answers poured in, all of them favorable. With so many boats offering help, our difficulty was no longer one of co-operation but one of elimination. We finally settled on the "Star of the Sea" and also accepted the offer of an immediate flight over the island of San Benedicto in the tuna-spotting plane of the "Southern Queen" for aerial photographs and further observation.

At the end of this flight, we again headed for the beach where a landing looked favorable. Our rowboat was twice the size of the one used previously, and just as before, rollers slid beneath, rose to sudden crests, and crashed upon the pumice beach while we waited for the fabled calm. And then in a matter of seconds, all similarity to the other landing ended. A crest appeared directly beneath the craft, tumbled the boat off its forward edge and then crashed upon us, spewing men and equipment under the boiling surf.

Cameras, film, food, and sleeping bags floated away or sank to the bottom, to be carried out by the

backwash of the sea. While we were retrieving the equipment that remained in sight, we stumbled not once but many times upon the trap that made this beach so treacherous. Right at the breaker line there was a steep beach, which made each incoming roller suddenly change from deep to shallow water. Even walking on this peculiar beach was extremely difficult, especially when the surge was rushing underfoot on its return to the ocean. The low-gravity pumice didn't know whether to lie down and act normal or float off with each wave.

This late afternoon landing was a real catastrophe. One of the two lost cameras and some of the film were necessary for the planned night exposures both in the crater and at the lava delta. Even as we dried our remaining equipment and bemoaned our losses, the surf became more turbulent, and it was soon apparent that luck would have to be with us to successfully launch the unloaded boat and get the oarsmen to the waiting tuna clipper. Here we had a break, however. The calm that failed to materialize whenever we were aboard, suddenly flattened the water until the rowboat was beyond the line of danger.

Several times during our night on the beach, occasional traces of sulphurous gas swept over us, and during a wakeful moment the glare of the reflected light from the volcano above and the delta at our



▲ A 50-FOOT lava cliff inside the crater. The rocks here were coated with sulphur

▼ PANORAMA OF BOQUERÓN CRATER. Intense heat and noxious fumes made it difficult to procure samples of the rock in this zone



feet prompted one of us to remark, sleepily, "Wonder if they are right. Are we nuts for being here?"

The next morning these questions were almost answered. The hour before daybreak brought dense black clouds of steam and volcanic ash cascading down the crater's sloping sides—clouds that seemed to resemble the notorious *nuées ardentes*. Everything but our immediate beach and the south end of the island was completely obliterated by an opaque pall. Then, as we hurriedly climbed out of our sleeping bags, rain drenched us. For a moment, this deluge consisted of clear water, but soon the drops from the higher altitudes picked up the air-borne ash and became mud pellets in their descent, building a half-inch crust on everything in their path, and there was absolutely no shelter on El Boquerón Beach!

Far off-shore, Erlin Perreira, Captain of the "Star of the Sea," turned his binoculars on the curtain of smoke that hid all but the extreme ends of the narrow three-mile island, but without avail. Even as the smoke gradually lifted, diligent search with the glasses disclosed only barren beach seemingly devoid of life. We were there, however, crouched against a tan cliff with an overall mud-pack administered in the strangest way. Like our equipment, we were so protectively colored to match the surroundings that we almost had trouble seeing each other.

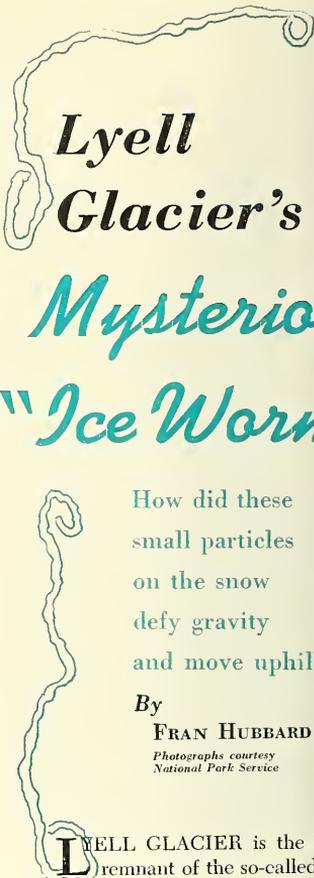
As a last resort, the Captain finally had the speed boat lowered and sent ashore, towing a rowboat in a further attempt to locate us. The surf had calmed considerably during the night, and ultimately we were discovered. The landing and launching of the boat from San Benedicto Island and our swim beyond the breaker line was uneventful—so much so that we almost felt cheated of some unknown thrill that was our due. But later, as we circled the belching island before starting our journey home by hitchhiking via tuna clippers, we tried to visualize the changes that might

have occurred on the inside of the crater, judging from the actions of the steam that now filled it from rim to rim, and we very quickly arrived at this startling conclusion.

Not so many hours before, there had been one section of the floor on the northeast side that lacked fumaroles and other evidences of heat so prevalent over the rest of the crater. This was the one and only area that gave the appearance of perhaps being cool enough to allow a partial approach toward the center. If the surf had not claimed our cameras, dawn might have found us testing that route. It was a spot from which thick, black gases were now shooting a thousand feet above the rim in a pressurized eruption that had lasted for hours. This picture, mentally drawn, took on startling proportions. It was our beach catastrophe, bemoaned at the time, that kept us from a crater camp that night. And quite possibly, if all our landings had been smooth, the jocular term "Operation Cremation" might have become fact!

As a postscript to our adventure, Dr. F. P. Shepard, Professor of Submarine Geology at Scripps Institution of Oceanography, has kindly supplied the following summary: "In order to investigate the geology, biology, bathymetry, and underwater sounds of the volcano, Scripps Institution sponsored expeditions led by Adrian Richards in March and November to San Benedicto and the other islands in the archipelago. Five photographic flights have also been made to Boquerón Volcano by personnel of Scripps Institution in co-operation with the U. S. Navy. During these flights underwater volcanic sounds were recorded for the first time in history; they were broadcast from small radio transmitters which were dropped from the plane. Detailed maps and charts are being prepared at Scripps and the data obtained on these trips is being studied there and at three other universities."

Thus we can close our account of the birth of Boquerón.



Lyell Glacier's Mysterious "Ice Worm"

How did these
small particles
on the snow
defy gravity
and move uphill?

By

FRAN HUBBARD

Photographs courtesy
National Park Service

LYELL GLACIER is the last remnant of the so-called "Ice age" remaining today within boundaries of Yosemite National Park. As the Park Naturalists of 1953 glacier survey field party were measuring the surface of Lyell west lobe on the afternoon of September 28, their attention was drawn to a large number of small, worm-shaped grooves in thin crust of two-day-old snow. The end of each wiggly groove was a minute object, but no two were the same. Of the seven examined three were bits of rock, two, small pieces of dirt, and two, small dead insects. Colors ranged from black (the dirt), to almost white (the insects). The grooves followed a set pattern but ran in all directions uphill and down. They varied in length from two to more than ten inches. The only constant fact



▲ THE CURIOUS "WORM TRACKS" were found widely distributed over much of the glacier at upper right

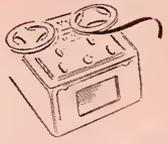
▼ THE SMALL STONE at lower right caused this "ice worm" to form in fresh snow on the surface of Lyell Glacier. Just how, remains a mystery

the presence of the small for-
 body at one end.
 as the wind responsible for the
 ation of these "ice worms"? If
 why did no two of them run in
 ame direction? Angle of the
 seemed to have no apparent
 ng on the pattern. Was the
 he cause? If so, why didn't the
 les melt down out of sight, as
 objects have done on the
 r's surface? Perhaps it was a
 nation of the two. Or per-
 his will prove to be another
 lained mystery of movement.



LYELL GLACIER'S MYSTERIOUS "ICE WORMS"

Village Life as it Was



FRESH FROM THE FIELD

A letter from the author of
Coming of Age in Samoa and
Growing Up in New Guinea,
who has returned to the Admiralty Islands
to see what changes
civilization has wrought in 25 years.

25th Reunion at Manus

By Margaret Mead



Their passion for bargaining and the accumulation of wealth once caused the Manus tribe to be likened to the American people. Now that they are becoming civilized, they refute our materialistic reputation and admire us for "caring more about people than things."

AND what is it like to come back, after 25 years, to the same village, to a people who have traversed centuries in that short space of time? Well, for one thing, it gives one a new kind of understanding of what has happened in our own past. You see what it must have meant to our own ancestors when they first learned to write, first heard about a calendar, or first heard, about roads and laws.

If one goes to study a group of primitive people who are just being affected by civilization, one is almost sure to be *against* the changes that are bound to come. The old native culture seems like a beautiful, finely-woven texture into which cheap trade goods have introduced an ugly and alien note. Since one's task is to rescue the old, one usually becomes so attached to the old that the new can only be viewed with hostile eyes.

Here in Manus, however, it is different. For one thing, I didn't think the old culture, as I saw it 25 years ago, was very attractive, although it was picturesque to look at—the thatched houses standing like long-legged birds in the water, the strong, lithe women in their crinkly grass skirts, the children tumbling in the shallow lagoons, canoes skimming over the water with square spread sails. But their way of life was a harsh and coercive one, which turned jolly, curious, generous children into grasping, driven, quarrelsome adults, always seeking to add one dog's tooth to another, while unrelenting ghosts presided over every household, driving each house-owner on to bigger economic enterprises. It was a society in which there was rhythm but no melody, vigor and intelligence but little happiness, activity but no rest.

People died young, worn out from trying to meet their endless obligations. The village lay open to the moonlight, but there was no dancing—only quarreling about debts.

I have come back to find the people whom I knew as young people and children and babies still the same community, with sons and adopted sons following in their fathers' footsteps. "You remember his father never was one for going about much," someone would say. Or "You remember when she was born and they thought her mother would die," or "He lived in the back of my uncle's house when you were here." With faultless exactitude each person put himself back 25 years so as to remember where a house would have been, how old a child was, or by what name I would have known someone. Perhaps it is because I know them as individuals and remember the wistfulness, the violence, the patience, and the bumptiousness of individual children that it is easier to sympathize with what they feel today. At any rate, their attempt to span centuries within a few years—to move from an illiterate people having no form of government and owing allegiance to the recently dead ghosts of each household, to become a literate, responsible, self-governing community—appears as a small-scale model of man's effort to take on, from groups of other men, forms of social organization and civilization higher than those he knows.

This little village is now built on the land, and only the posts of the old lagoon village remain to show its ground plan out on the water. There is a school. It is not a school to which the children are lured or dragooned into coming, against their own and their parents' wishes,

but a school that is their own. The self-taught teacher sets up sums on an old piece of blackened plywood, while the children sit on rough benches with clip-boards on their laps, writing on the backs of old army forms—all the abandoned bits of World War II turned to a new use. Late at night, one will hear a strange kind of chanting, but it is no primitive magical ceremony. It is a group of boys, sitting around a lamp made of an old tin can with a small sputtering cloth wick, reading English aloud in chorus. Twenty-five years ago, the men, naked except for bark cloth G-strings and with elaborate ornaments of shell and bone, danced defiance at each other with obsidian-tipped spears. Today their sons, now grown, ponder slowly how to adapt Robert's *Rules of Order* to village purposes. When voices are raised and the old tendency to shout and stamp asserts itself, the young clerk, just literate, whose grandfather used to terrorize the whole South Coast, rises and slowly and painfully reads the rules about majority and minority behavior!

The native medical assistant says he is ready to go and see the patient. He walks with empty hands, but the thermometer is stuck securely in his hair (where pencils also are kept). Today the people can read and interpret thermometers and keep records of births and deaths. Twenty-five years ago there was an eclipse of the moon, and I explained it to them. This summer, there was a similar eclipse, and the people remembered the explanation and did not give it a magical and threatening interpretation as some of their neighbors did.

The Manus people, the people

who are the true salt-water people, have persuaded some of the cannibal landspeople to come down "inside," and now the children of cannibals sit and discuss whether carrying children spread-eagled on the back is a desirable method of child rearing.

Today I went to a ceremony. A man from the next village had come to inspect the money that his kin here will exchange with him for bags of rice and flour and sugar. Instead of strings of dogs' teeth and long strands of shell money and bands of bead work, Australian paper and silver money lay on the pandanas mat—ten shillings ("the red one"), a pound ("the green one"), and a five-pound note ("the blue one"). Esthetically, it is far less picturesque, but one has to have seen the old system, to appreciate what the people feel when they say: "Our money was only something that could buy what we ourselves made; your money can buy things from all over the world." In the old days, the competitive exchange of property put a heavy burden on every self-respecting man. Recalling this today, they say, "Now it is against our rules to pay more than five pounds for a wife, and we have forbidden the big, continuous exchanges of property, which were very hard and caused our strong men to die young. What we did once in earnest, we now do only for fun, just a little, freely and without coercion." And, acute in their realization of what is happening, they say, "The men 'in the middle' remember the old quarreling ways and bring some of them into the new, but the young men will be able to really play."

Clear-eyed, proud, self-reliant, they say: "Yes, we have seen what you have learned to do. Inside your country, things are straight. Your children do not die and die and die. Your old people live to a real old age. People do not work so hard that they are destroyed. People are regarded as nonreplaceable, whereas you have so many things that you can always get more if some are lost." And so the people who

once ruined the coolness of the tropical night with drummings and fury over a broken pot, learned from the way the American Army dumped tons of equipment, that people matter more than things.

By the freak of circumstance that caused them to be selected for intensive study 25 years ago, they and their new experiment in civilization now stand on a lighted stage. During the long evening meetings, in which men, women, and children all vote (for no one has told them that children aren't fully people), they jack up each other's morale by conjuring up visions of what "All America" will think of them if I have to report deficiency in the orderliness with which they conduct their affairs. One may argue that they have drawn a Utopian and nonrealistic picture. That may be true, but then you hear them say, "You have learned the things we want to learn: how to keep babies from dying, how to keep roads in repair, how to make the sick well, and how to make people take their quarrels to court." Of all our institutions, the court is the one that fascinates them most. In court, threats and fear are relegated to some lower order of existence, and law reigns; so, people sometimes dress for court, putting on their upper garments.

This afternoon there was a long meeting about repairing houses and working a supply of sago for Christmas. It ended with the statement: "If you don't pay attention and learn how to do things, you and I, ourselves, can ruin ourselves. If we want to walk over the land, the road will be closed. If we want to go inside the ground, the road will be closed. If we want to fly up in the sky, the road will be closed. But if we all pay attention, we yet ourselves can make our village *gerup*." *Gerup* is a pidgin English term which came from "Get up," but it has no English equivalent. The word means to awake, to start up, to leap up, and—in this case—to lift oneself by one's own bootstraps.

My Bout with a LUMPFISH

By

BERNARD L. GORDON



ON the first day of spring this year I took a walk along the docks at Stonington, Connecticut, to see what the fishing boats were catching. At Longo's Dock, four draggers were waiting to unload their haul, and I saw this fish lying helpless on the hatch cover of the 80-foot dragger "Jane Dore."

It was a bluish-gray fish, almost as wide as it was long. The slightly grotesque creature was vaguely familiar, but its name slipped my mind. On its back were one big hard lump and one small one, and its skin was completely covered with dark specks and blotches. On its sides were more lumps in three rows. It had a large white suction apparatus on the undersurface. The fish was about two feet long.

I asked the boat's skipper, Captain T. A. Silva, where he had found such a strange fish, and he said it came up in the nets about



◀ It was a blue-gray fish about two feet long, with lumps on its back and sides

Photo by Bernard L. Gordon

An endurance test behind the closed doors of a university laboratory establishes a new record in the egg-laying capacity of a curious fish

three miles from Watch Hill, Rhode Island. "I catch a few of these every spring," he said, "but the rest of the year they don't seem to be around."

I asked the skipper if I could take the fish to the University of Rhode Island Marine Laboratory, where it might have some scientific value.

"Sure," he said, "help yourself. We've got a good load of 'junk' today." He was bringing in "trash" fish, the kind that are rendered and processed for fertilizer and meal. I later found out that the draggers were getting only 80 cents a hundred pounds.

"Better take some ice with it," warned the Captain, "or you won't

be able to stand the odor in the car."

I put the slimy fish into a wooden box with some ice on top. That evening I went through Breder's *Field Book of Marine Fishes of the Atlantic Coast*. I found the odd fish to be a lumpfish, *Cyclopterus lumpus*. The next morning, I took it to the University in Kingston. Most of the ice had melted, and the fish was beginning to make its presence known. Professor Robert A. De Wolf saw me coming with it and said, "That's a pretty big lumpfish, Gordon. I don't believe I've seen one quite that big."

I told Professor De Wolf that I had brought the creature in to study its anatomy. He seemed a bit

surprised but replied: "I've got a box of tools there on the shelf. Do you want to start in on the dissection?"

"Okay," I said nonchalantly, "but I want to take its weight and measurements first."

The lumpfish weighed 21 pounds, 4 ounces, and its length was 23½ inches. I carefully checked all the books on fishes in the college library and found that my specimen of *Cyclopterus lumpus* was larger than any other previously reported in North America.

Well, I began to dissect the largest North American lumpfish in captivity. I found it to be a female with its body cavity bulging with pink eggs. I carefully removed the

egg masses, getting them all, since I thought I would want to count them to see just how prolific this "lump" was.

The eggs and ovaries weighed five pounds, four ounces, or approximately a quarter of the lumpfish's total weight. Nichols and Breder, in their book about New England fishes, state that lumpfish eggs are pink when first laid, so I assumed that this female had been about to issue her eggs.

It was impossible for me to count the eggs right away, because mid-semester exams were coming up. So Professor De Wolf suggested that I put them in a glass container with a little formaldehyde until I could make a lumpfish egg census. I did this, and in the formalin solution the eggs shortly changed from pink to yellowish-orange.

A week after mid-semester exams were over, I began the tedious task of counting the multitude of eggs in my spare time. Dr. Breder mentions in his book that large lumpfish females up to 18 inches produce as many as 136,000 eggs. My female lumpfish was $23\frac{3}{4}$ inches long. When I started to count the

eggs, I found to my dismay that the formaldehyde had for some reason not produced the desired effect. The eggs had assumed the fragrance of a dead fish that had lain in a dark, damp corner for six months.

So, holding my nose with one hand and the fish eggs with the other, I began to count them, at first singly, then by unit of weight. The faculty members of the Zoology Department took a deep breath and closed the door of the laboratory I was in. All the windows on the second floor of Ranger Hall were open that day, but it was a toss-up whether I should burn my clothes when I got through or take a chance with the cleaners. The cleaners won out. However, my efforts were rewarded. After the odorous escapade, I totaled up my figures and found that this "lump" contained 279,620 eggs. Perhaps you can imagine my pride in having bettered the celebrated Breder (no pun intended) by 143,620 eggs!

Professor Donald Zinn had seen quite a few lumpfish, but they had always averaged between three and five pounds—less than the egg mass

alone from my fish. I took three of the photographs of the fish that accompany this article, but by now it had become somewhat notorious, and the University's publicity bureau sent over a photographer to photograph Dr. Zinn, the lumpfish, and me. This picture appeared in the Providence *Evening Bulletin*.

I did a bit of research into the life history of lumpfishes and found that they have some unusual habits. The male "lump," like the sticklebacks, guards the eggs until they hatch. Throughout the period of guardianship, the male does not eat but continually fans the egg mass, thus keeping it free of silt and bathing it in flowing water. He never leaves the eggs except to drive off intruders. To protect them, he has been known to attack and kill such a fearsome creature as the wolf fish. By the time his vigil has ended and the eggs are hatched, he is thin and exhausted. The females, on the other hand, take no part in guarding the eggs and are said to move into deeper water as soon as they have finished spawning.

Yearling "lumps" average a little over two inches in length, and the fish are said to attain maturity in the third year. They become about ten inches long in their fifth year. I guess my "lump" was pretty well along in years.

Large lumpfish are usually found hiding in rockweed or holding fast by the sucker to stones or other objects. In Massachusetts Bay, they occasionally attach to lobster pots, and in Maine and Scottish waters they have been found clinging to the posts of a trap or weir. There is a record of one "lump" sucking to a mackerel. Since they are weak swimmers, lumpfish can be easily preyed upon, and they are said to be a favorite food of seals.



◀ PROFESSOR DONALD ZINN and the author inspecting the record lumpfish at the University of Rhode Island



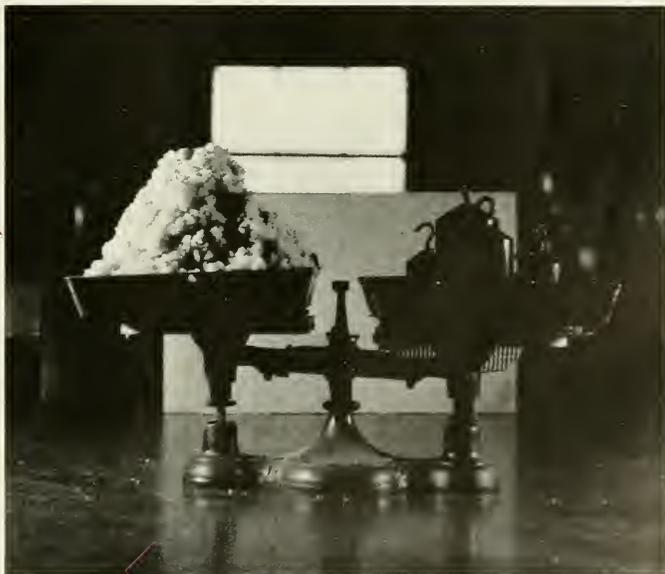
▲ THE LUMPFISH weighed 21 pounds, 4 ounces and was larger than any previously reported in North America

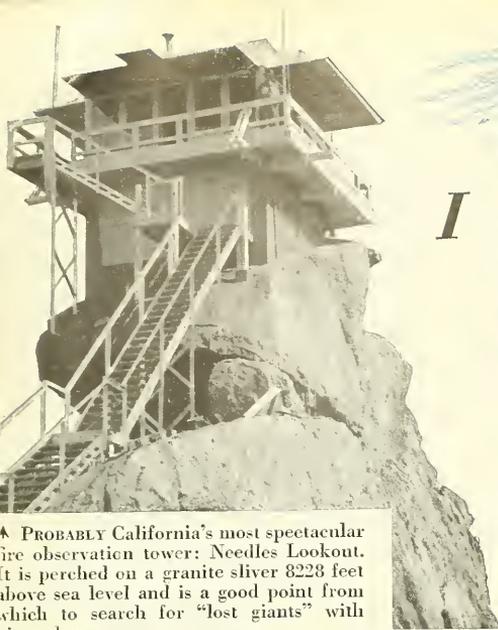
➤ 279,620 LUMPFISH EGGS. Before the counting was over, the author had the laboratory to himself

Photos by Bernard L. Gordon

The lumpfish is never eaten in the United States, but it is an important fish in Greenland, Iceland, and northern Europe. One may also see the eggs sold as "lumpfish caviar" in New York City and elsewhere.

I haven't decided yet what I'm going to do with the next lumpfish I come across, but you can be sure of one thing. I'm not going to count its eggs.





▲ PROBABLY California's most spectacular fire observation tower; Needles Lookout. It is perched on a granite sliver 3228 feet above sea level and is a good point from which to search for "lost giants" with binoculars

I Collect

BIG TREES

Remote groves in California's Sierra lure the adventurous soul, for they may still hide Giant Sequoias greater than the present record holders

By WELDON F. HEALD

Photographs by the author



SOME people shoot big game, others fancy rare postage stamps; millions play canasta or subsidize the ponies, and there is a growing army of rockhounds. In fact, nearly everybody has some kind of a hobby. I am no exception, but perhaps my avocation is a bit unusual. I collect the biggest trees in the world.

Of course, I don't carry them home and display them proudly in glass cases, but I am a rabid and fanatical tree collector nevertheless. Each fall I take a trip into the southern section of California's Sierra Nevada to explore remote, little-known groves of sequoias and to search for fabulous "Lost Giants," reported to be twice as big as any tree now known. I haven't rediscovered any of these elusive arboreal mammoths yet, but does any prospector worth his salt ever give up hope of finding the Lost Dutchman or Breyfogle mines? And I am thoroughly convinced that big-tree hunting is the most stimulating and satisfactory hobby there is.

For the sequoias are remarkable in every way, and their story is strange and dramatic. The first sequoia-like trees appeared when reptilian monsters roamed the earth in the Mesozoic era, perhaps 125 million years ago. Through the ages this colossal breed of tree prospered and spread in vast forests over four continents. Fully 45 species of fossil sequoias have been found in the rocks of the Northern Hemisphere alone, and for eons this kingly tree was supreme in the vegetable world. Then, little by little, its dominance slipped away until today only two species of sequoia remain. Both are making their last stand near the western edge of North America. A third closely re-

RECORD-BREAKING Giant Sequoias hide? In incredibly rough country, far trails, lie the southernmost groves. ew looking eastward from the top Greenhorn Mountain section of the Nevada spans Kern River Canyon, s 4000 feet deep

I COLLECT BIG TREES



▲ TREE COLLECTOR'S REWARD: the Boole Tree, third largest Giant Sequoia. It towers above ravaged Converse Basin and bears the name of the foreman who saved it during lumbering operations in the 1890's

lated species, found in the fossil record but thought to have been long extinct, has recently been discovered in central China. This is the *Metasquoia*, or Dawn Redwood.*

With an eternal vigor, surprising in the last survivors of an ancient race, the two species of sequoias still stand, stoutly defying the ravages of time, man, droughts, fire, pests, and changing climates. Although they are very closely related and have a family resemblance, each is a distinctive personality. The *Sequoia sempervirens*, known as the redwood, grows along the cool, foggy coast of central and northern California into southern Oregon. Redwoods form dense twilight forests of almost tropical luxuriance and are the world's tallest trees, reaching an extreme height of 364 feet. But they cannot compete in bulk with their ponderous inland relative, the *Sequoia gigantea*, popularly called simply the Big Tree or Giant Sequoia. Often reaching a diameter of 25 to 30 feet and a stature of 300, these giants dwarf the rest of creation, and their 4000 years of life make us feel like momentary visitors on earth. Among trees like this I find my specimens, and I believe through the years that my sequoia collection has become one of nature's grandest exhibits.

Unlike the redwoods, California's Big Trees live near mountaintops and thrive in spartan surroundings of winter cold and deep snows. They are found in 70-odd groves scattered along a 240-mile stretch on the west slope of the Sierra Nevada. The largest and finest grove is Giant Forest in Sequoia National Park. There, towering far above the pines and firs, are 3500 big trees over 10 feet in diameter. Patriarch of them all is the General Sherman, greatest known living sequoia.

But these are tourist trees, celebrated the world over and gaped at by admiring thousands. There is not much new here to be discovered by an ardent sequoia fancier. So



▲ MASSIVE IN BULK, the Boole Tree has a diameter of 33 feet and a height of 269

my collecting grounds are to the south—fascinating, little-known, seldom-visited groves tucked away among the rugged ribs of the mountains. Some of them are far from trails, hidden in incredibly rough country, and probably undisturbed by human beings in half a century. It is in these secluded groves that one feels the true impressiveness of the sequoias. A golden sunlight filters down through the high-arched green foliage onto the massive living trunks, and a primordial silence pervades the aisles between the trees.

These groves, too, are the ru-

mored homes of mysterious, gigantic sequoias so big that the General Sherman is a sapling in comparison. One of these legendary behemoths was described in a publication of the old Kaweah Colony for April 24, 1889. Long forgotten, the report gathered dust in the Visalia Public Library until unearthed a few years ago. Under the title, "A Giant Tree," the article reads in part:

"Fred W. Clough, a well-known engineer of the Comstock, has been spending some weeks in the wilds of the Sierras about the headwaters of the Kaweah River . . . He was accompanied in his wanderings by

* See "Redwoods in China," by Ralph W. Chaney, NATURAL HISTORY, December, 1948.

Wesley Warren, an old Comstocker who now resides in Tulare Valley . . . Mr. Clough says that on one trip they discovered a tree of the sequoia species, which he believes to be much the largest tree on the continent of America . . .

"The men had with them no rule, tape line, or measure of any kind, but Mr. Warren measured the tree with his rifle, which is four feet in length. He found it to be forty-four lengths of his gun in circumference at a point as high above the ground as he could reach. The top had been broken off, but it is still of immense height. This monster tree stands in a small basin near the Kaweah and is surrounded on all sides by a wall of huge, rugged rocks. There is so much brush in the vicinity that the little valley in which the big tree stands is almost inaccessible."

A tree 176 feet in circumference—75 feet greater than the General Sherman! Here was something to make a sequoia collector's mouth water.

Although there are some discrepancies in the description of the tree's location, it apparently was discovered in one of the small groves that cling dizzily to the steep south face of Homers Nose in the southern section of Sequoia National Park. This is rough trailless country, up under an aquiline granite beak 9005 feet in elevation, and I know that no one might have been

there since Clough and Warren.

So, filled with a collector's zeal, I shouldered packs one morning with Albert Marshall, rancher, artist, and fellow Sierra Club member, and we set out from Three Rivers—destination Big Tree. We followed the pine-shaded crest of Case Mountain, dipped into the charming little sequestered Coffee-pot Grove for lunch, and camped the first night at a spring under Salt Creek Ridge. Next day we began to traverse the south slope of Homers Nose.

Up to this point Albert and I had always fancied ourselves hardy mountaineers. But here was some of the toughest going either of us had ever tackled. Not a square inch

was level, and the whole mountain-side plunged precipitously down 4500 feet into the canyon of the Kaweah River's South Fork. We crawled up on hands and knees through matted tangles of brush; we labored over an endless succession of rocky ridges, and slid from tree to tree down 45-degree slopes on slippery pine needles. It took us two full days to cross three horizontal miles to the Hockett Trail, but we must have covered half again that distance vertically. And, what is more, we didn't find the Clough Tree!

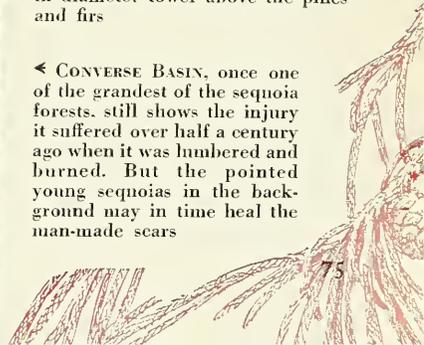
However, we did discover a matchless, sparkling primeval country, and we explored gemlike sequoia groves strung like emeralds

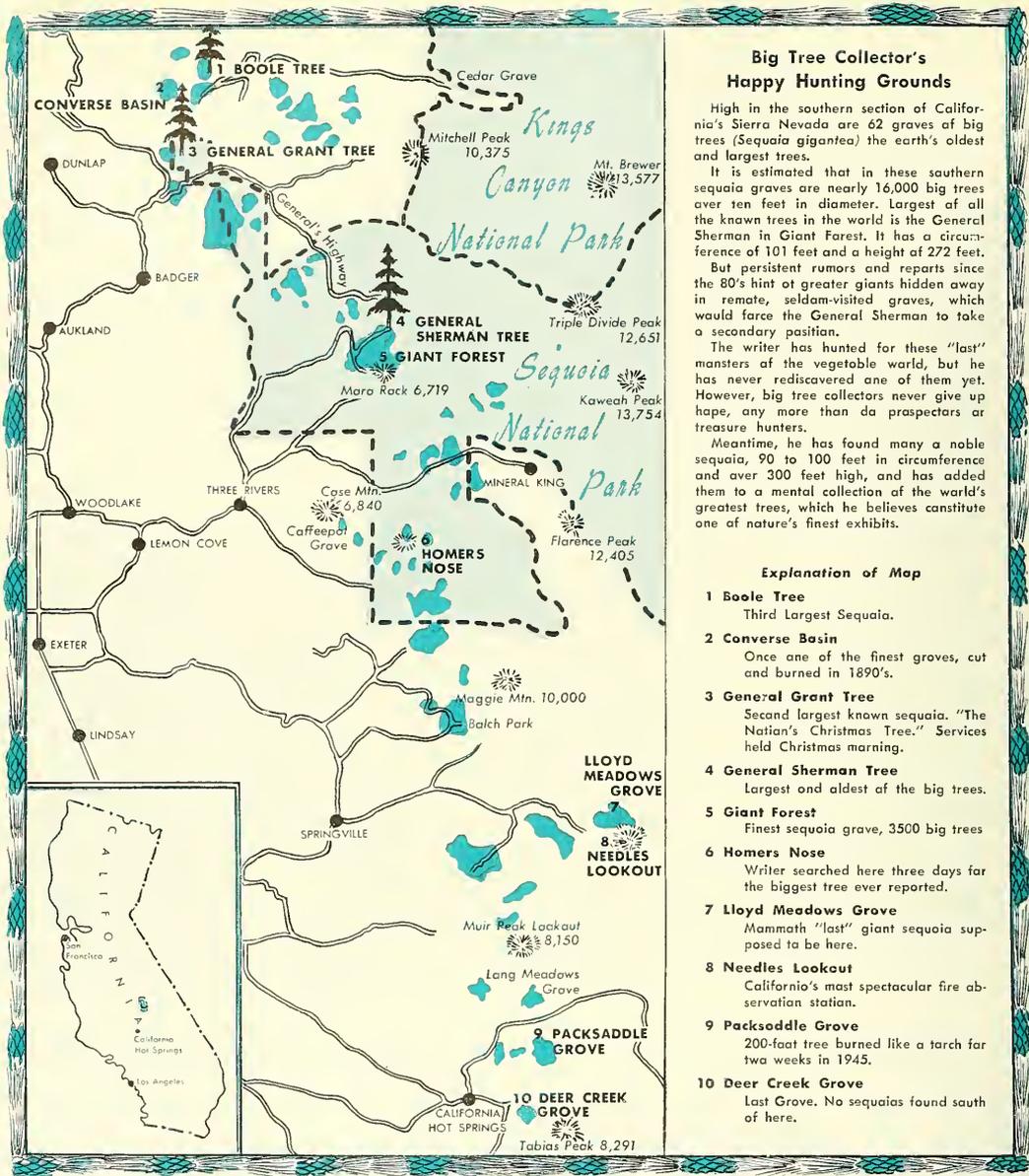


▲ **UNLIKE THE REDWOODS**, Big Trees thrive near the mountaintops in rigorous temperatures. A bulldozer is seen here battling five feet of snow to keep the road open to Giant Forest. This is the largest grove in Sequoia National Park. In it 3500 Big Trees more than 10 feet in diameter tower above the pines and firs



◀ **CONVERSE BASIN**, once one of the grandest of the sequoia forests, still shows the injury it suffered over half a century ago when it was lumbered and burned. But the pointed young sequoias in the background may in time heal the man-made scars





Big Tree Collector's Happy Hunting Grounds

High in the southern section of California's Sierra Nevada are 62 groves of big trees (*Sequoia gigantea*) the earth's oldest and largest trees.

It is estimated that in these southern sequoia groves are nearly 16,000 big trees over ten feet in diameter. Largest of all the known trees in the world is the General Sherman in Giant Forest. It has a circumference of 101 feet and a height of 272 feet.

But persistent rumors and reports since the 80's hint of greater giants hidden away in remote, seldom-visited groves, which would force the General Sherman to take a secondary position.

The writer has hunted for these "last" monsters of the vegetable world, but he has never rediscovered one of them yet. However, big tree collectors never give up hope, any more than do prospectors or treasure hunters.

Meantime, he has found many a noble sequoia, 90 to 100 feet in circumference and over 300 feet high, and has added them to a mental collection of the world's greatest trees, which he believes constitute one of nature's finest exhibits.

Explanation of Map

- 1 Boole Tree**
Third Largest Sequoia.
- 2 Converse Basin**
Once one of the finest groves, cut and burned in 1890's.
- 3 General Grant Tree**
Second largest known sequoia. "The Nation's Christmas Tree." Services held Christmas morning.
- 4 General Sherman Tree**
Largest and oldest of the big trees.
- 5 Giant Forest**
Finest sequoia grove, 3500 big trees
- 6 Homers Nose**
Writer searched here three days for the biggest tree ever reported.
- 7 Lloyd Meadows Grove**
Mammoth "last" giant sequoia supposed to be here.
- 8 Needles Lookout**
California's most spectacular fire observation station.
- 9 Packsaddle Grove**
200-foot tree burned like a torch for two weeks in 1945.
- 10 Deer Creek Grove**
Last Grove. No sequoias found south of here.

around Homer's scrawny neck. Maybe Clough's Big Tree is there—maybe not. It would take a week to search every nook and cranny. But Albert and I are going back to that wild, eerie land under Homers Nose to look again. Definitely.

And because, like Clough and Warren, we forgot our tape, we devised a new scientific wrap-around

unit for measuring Big Trees, called "The Albert." It is exactly six feet in length and does not have to be carried over the mountains from tree to tree. It walks.

However, all sequoia hunts are not as difficult as this one was. Sometimes the collector can search from an armchair. Another monster tree was reported from the Lloyd Mead-

ows Grove in Kern River Canyon. Directly south, 2650 feet above, is perched Needles Lookout, probably California's most spectacular fire observation station. Dizzily balanced on a granite sliver 8228 feet in altitude, it is reached only by a steel stairway of 100 steps anchored into the rock. On my last visit, the station was manned by a University

of Minnesota student who was majoring in forestry. Over a lunch of frankfurters and beans, we had a lively discussion about the gigantic "lost" sequoias. Then we passed a couple of hours on his little veranda in the warm sun, scanning the Lloyd Meadows Grove below with binoculars. Again we didn't locate the supergiant, but I cannot imagine a pleasanter afternoon, spent as if suspended in an observation balloon high above the world.

But we sequoia hunters do on occasion find big trees. One of the favorites in my collection is the Boole Tree, third largest known sequoia, with a base diameter of 33 feet and a height of 269 feet. Named for the logging foreman who spared it, this solitary hermit rises in splendid isolation above desolated Converse Basin, a superlative grove of big trees which was completely cut and burned in the 1890's. Surrounding the Boole Tree are hosts of arrowy young sequoias springing up to hide the utter man-made devastation. Then there are the cathedral-like groups of trees at Long Meadow, where I camped one unforgettable moonlight night; and huge "Methuselah," standing high above a pine and fir forest near Balch Park. Another rare find was a grand old sequoia, measuring at least fifteen Alberts in girth, which we found hidden away in the depths of the seldom-visited Packsaddle Grove.

It was in this grove on August 5, 1945, that lightning struck a giant sequoia. Mule Peak Lookout spotted the smoke and phoned down to the Sequoia National Forest dispatcher at California Hot Springs. Forest guards were immediately sent up to the grove. They found the top 15 feet of a 200-foot tree flaming like the torch of the Statue of Liberty. There was no way to combat the fire by direct attack, so the guards ate, slept, and

lived at the base of the tree, keeping a watch day and night for ground fires that might start from wind-blown sparks.

After a week had passed, it seemed as if the fire were dying out. So the guards departed, leav-

ing one man on duty. But on the twelfth day a hot, dry wind came out of the northeast, which carried showers of sparks through the forest. Spot fires blazed up hundreds of feet from the burning tree. The entire watershed was threatened,



➤ A VETERAN SEQUOIA, 300 feet tall, towering above the arrowy tops of two younger sequoias, as well as pines and firs

and there was only one method by which it could be saved. A couple of hundred pounds of dynamite were packed up to the grove, and after considerable time and effort the grizzled veteran, eighteen feet through and as tall as a fifteen-story office building, shivered in a tremendous blast and crashed to the ground. The fire was then quickly put out, and everybody breathed easier. The Forest Service utilized all usable wood of the huge fallen sequoia to furnish fence posts, grape stakes, and shingles to the farmers in California's great agricultural San Joaquin Valley below. So, in a sense, the story had a happy ending.

But fortunately for the *Sequoia gigantea*, it cannot compete as a lumber tree with its coast cousin, *Sequoia sempervirens*. Otherwise there would be few Big Trees left. Savants with slide rules have computed the weight of the General Sherman Tree to equal that of 4000 automobiles; and it contains enough lumber to build a box completely around the 1000-foot liner, "Queen Elizabeth"—strange as such a procedure might seem—or to build 40 five-room houses. But Big-Tree wood is coarse and brittle, being suitable only for special low-grade uses. Besides, logging these trees is difficult, and campaigns to save the Big Trees have helped greatly to preserve them, with the result that fully 90 per cent of California's remaining Big Trees have been saved and now belong to the people of the United States. Conservationists battled long and mightily to preserve this magnificent natural sequoia heritage from greed and wanton destruction.

These impressive groves of mammoth trees were not always regarded with the appreciation we have come to feel for them today. They were first seen by Joseph Reddeford Walker's party, which crossed the Sierra Nevada into California in 1833, but it was not until thirteen years later that a startled world first heard of these "vegetable monsters." In the spring of 1852, a bear hunter named A. T. Dowd came down out of the mountains, his eyes

wide with excitement. He told of having seen trees as big around as houses and three times taller than the masts of the largest clipper ships. Nobody believed him, and the betting around Murphey's gold camp was even money that Dowd was either crazy or a liar. But he was speedily vindicated, became a hero, and his discovery made headline news overnight. Soon hundreds of people were streaming up the mountain to the Calaveras Grove to gape at the mighty sequoias.

Did these early sightseers stand in awe and reverence in the presence of these great patriarchs, which were venerable before Christ was born?

Not exactly!

The biggest sequoia was promptly cut down. Its huge stump served as a dance floor, and a section of the trunk was turned into a bowling alley. Next, several giants of the Calaveras Grove were stripped of bark for more than 100 feet above the ground. The pieces were numbered and shipped around the Horn to Boston, New York, Philadelphia, London, and Paris. There, the foot-thick bark was reassembled on frameworks to give amazed citizens an idea of the incredible size of California's mammoth trees—at a price, of course. Even Louis Agassiz, the famous Swiss-American naturalist, upon seeing one of these sequoia exhibits in Boston, wrote in a burst of enthusiasm; "Nobody who has any curiosity to see something of the wonders of nature ought to allow the opportunity of seeing a section of one of the big trees of California to pass unimproved."

So the sequoias became a popular freak side show rivaling Barnum's famed petrified mermaid and General Tom Thumb. Then, after the novelty wore off, the lumbermen swarmed in. Other groves of sequoias were discovered, and soon the mountains echoed with the sound of axes, saws, and dynamite as scores, hundreds, and finally thousands of gigantic trees crashed to the ground. It began to look as if the world's largest and oldest

living things would be as extinct as the dodo in another generation.

But at last, after a quarter century, help came for the beleaguered sequoias. Early in the 1880's, an ever-increasing group of conservation-minded Americans protested the senseless slaughter of these unique and irreplaceable forests. A long and bitter battle followed, in which the fate of California's Big Trees became a national issue. The fighting conservationists finally won in 1890. In that year an Act of Congress established Sequoia, General Grant, and Yosemite National Parks, which preserved for all time some of the finest groves of sequoias. Since then, grove after grove has come under the protection of federal and state agencies; and today we know that we, our children, and our children's children will continue to draw strength and inspiration from the noblest trees ever created by nature.

Even the name sequoia was a happy choice. Both the Big Trees and the redwoods honor the great Cherokee chief, Sequoyah. It was he who made an alphabet for his people and whose statue now stands in the Capitol rotunda at Washington. So the most remarkable of American trees immortalizes a distinguished American Indian. No more fitting name could have been found.

But it is not size alone that makes the Big Tree so impressive. Among the great, swelling, cinnamon-colored trunks of a sequoia grove there is a haunting sense of agelessness. Time ceases to have meaning, for these survivors of an ancient race link the present with the dim ages of the past. Christ, Caesar, and Columbus could have walked beneath these very trees; a world of history has passed around them, and yet they still stand in deathless dignity—undisturbed, serene, their tops reaching toward eternity.

"Talk of immortality!" said John Muir. "After a day in the woods, we are already immortal. When is the end of such a day?"

Do you wonder that collecting the biggest trees in the world is a compelling and rewarding hobby?



▲ IN A SEQUOIA GROVE there is a haunting sense of agelessness, linking the present with the dim ages of the past. Note the human figure in the foreground, dwarfed by the Big Trees

I COLLECT BIG TREES





THE BIG STRETCH

By

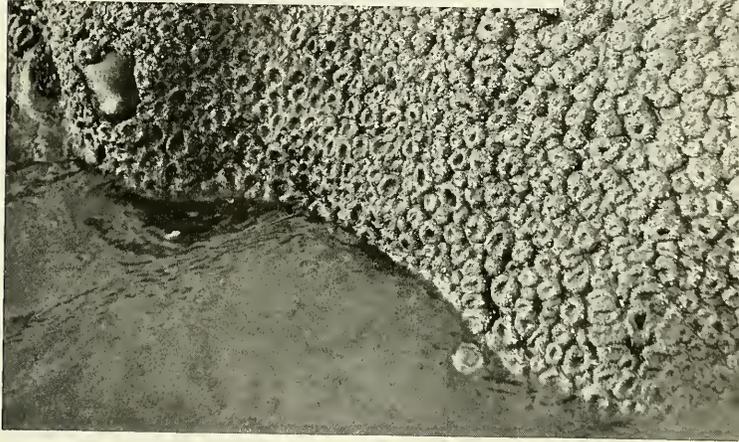
WOODY WILLIAMS

Photographs by the author

▼ A BEACH LIKE this, where the depth of the sand may shift as much as six feet during the year, provides an ideal home for the sea anemone *Anthopleura elegantissima*



When this
hardy inhabitant
of the tidal rocks
wants to multiply,
it simply
divides



ONE of the first creatures to set up housekeeping on rocks newly exposed by the shifting sands of the beach is the anemone known as *Anthopleura elegantissima*. It is perhaps the commonest anemone along the coast of northern California.

This hardy invertebrate thrives where the surge swirls the sand off the bottom. The rocks rapidly become mantled with the squishy anemones, whose convolutions,

▲ THE ANEMONES give the rocks the appearance of giant brain corals. Not many creatures can survive such extremes of moisture as this sea anemone. The changing tides daily subject it to immersion by the sea and the drying effect of wind and sun

▼ THE SEA ANEMONES in this crowded "convention" do not display their flower-like tentacles but remain con-

tracted. With the return of the tide, they will again expand to gather food in their accustomed manner





◀ A SEA ANEMONE beginning to divide by stretching into an oval disc. This photograph shows the adhesive foot of *Anthopleura elegantissima* clinging to the aquarium glass, while the upper end pulls away

▼ THE ANEMONE continues to stretch apart until the tissue connecting the two halves suggests a piece of rope. One strand breaks at a time



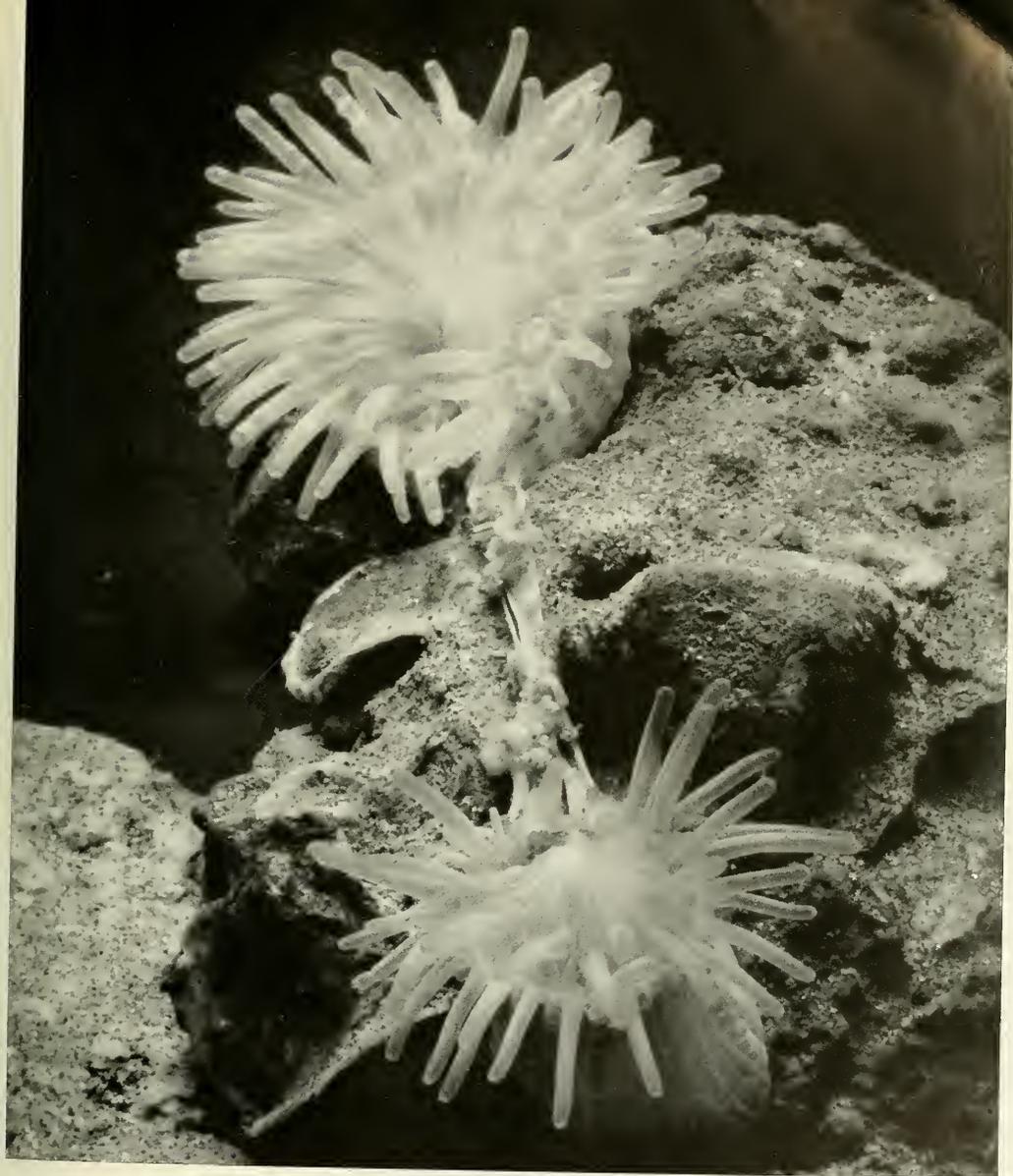
when the creatures are contracted at low tide, suggest the patterns of giant brain corals. Sometimes the masses are camouflaged by pieces of rock and shell held to the anemones by tiny suction cups. Sometimes an investigator drops wearily upon one of these rocklike surfaces only to find in a very short time he

has made a wet and cold mistake.

Underfoot the polyps huddle together, secure in their great numbers against destruction by rain, fog, sun, and wind, to which they are periodically subjected during the daily low tides. The rapid growth of these communities is perhaps explained by the ability of

Anthopleura literally to tear itself in two.

The "big stretch" begins when an anemone changes from a circular pattern to an elliptical one. The central mouth stretches so that a section of it and part of the internal anatomy are contained in each end. The parent end holds fast



▲ ONLY A NARROW cord holds the two sections together. A slight jar will break this tissue. The ends will then jerk back and there will be two anemones in place of one

while the opposite section slowly creeps off on its sticky base. The connecting link stretches until it resembles an unbraided rope, whose strands part one by one. After perhaps a week or more, only a single thread of tissue remains to connect the two sections. A slight jar sepa-

rates the offspring, and a new anemone is released into a turbulent world along the edge of the sea. The parent and offspring may slowly move away from each other. Gradually they repair the ruptured edges of their discs, until two complete anemones are formed, each

with a radiating crown of tentacles.

As these tentacles are armed with stinging capsules, the anemone has few enemies, except a large sea slug of a type called "colid," which makes anemones its exclusive dish. In some cases, the sea slugs have been known to ingest the stinging



◀ NOW ON ITS OWN, the offspring is attacked by an eolid, a sea slug that dines only on anemone colonies

▼ THE ATTACK of the eolid leaves the anemone in poor condition. Larger anemones, however, often recover and may indeed survive a number of attacks by sea slugs. The slug consumes the internal structure of the anemone, but the anemone can rebuild the organs consumed by the slug



capsules and to incorporate them into their own body as a useful defensive mechanism. The stinging capsules are lodged in the tips of the plumes on the sea slug's back. These plumes are hollow tubes with respiratory and digestive functions.

The slug eats out the internal structure of the anemone and leaves it a crumpled sack. But the anemone has a remarkable ability

to restore order from a torn mass of tissue, and it can quickly rebuild organs consumed by the slug. Larger anemones can survive several attacks by the sea slug. The sea slug, for its part, has chosen a dinner plate which, like something out of mythology, is never empty.

Anthopleura also offers a home for certain one-celled algal plants, which thrive within the tissue and

give the anemone its green color. Sometimes these anemones live in caves and under wharves. In such locations, there may not be enough light to support the photosynthetic activity of the algae. Then the anemones revert to their natural color of white with pink-tipped tentacles.

These elegant and delicate-looking anemones are some of the toughest marine creatures on the



THE PARENT ANEMONE slowly repairs ruptured section of the disc until it forms a symmetrical crown of tentacles

AN AGGREGATION of anemones different from the kind shown in the preceding photograph but related, probably *Anthothura artemisia*

West Coast. Where the waves pound, they live on rocks in the upper tidal zone exposed to drying; and in the estuaries, they inhabit silt-laden water often polluted with sewage. In the bays, we do not see the dense aggregations found on the outer coast. Instead we find individuals with their stalks elongated deep into the mud, where the bases adhere to buried rocks or ancient pilings.

THE BIG STRETCH





▲ THE HUMPBACKED MOTHER, still bowed down with all her family responsibilities at nine weeks

AUSTRALIA'S

Pouched "Cat"

Its young are only one-sixth of an inch long at birth, but they stay in their mother's built-in nursery for over two months

By DAVID FLEAY

Photographs by the author

ONE dark night in January, 1946, during an expedition I had organized to search for the nearly extinct Tasmanian Wolf, we were driving a truck along the Queenstown Road, immediately below the craggy dolerite walls of the Mt. King William Range in west-central Tasmania. Suddenly, several little animals ran erratically across the road. The headlights showed white spots, frantically waving tails, and attractive big-eyed faces.

This was a rare treat for anyone

with even an elementary knowledge of Australian native animals, for here we were seeing in the wild, as did the early settlers, the pretty little "native cat," now so scarce as to be almost gone from the mainland.

It is about the size of a cottontail rabbit and is in no sense a real cat. It is a marsupial or pouched

animal, correctly referred to as a dasyure (pronounced DASSY-oor). Its scientific name is *Dasyurus quoll*.

Before 1900, this little animal was found in teeming thousands in southeastern Australia. The dainty creature's lack of caution, which has helped toward its early extermination, was clearly exempli-

fied when we later set several box traps one evening in the area of King William Range. We baited them with bacon and dragged trails by means of a singed bullock's heart on the end of a rope for several hundred yards from one trap to another. Believe it or not, once the frisky little creatures scented that trail, they practically formed a queue for the privilege of entering those traps! While watching from a distance, we caught half a dozen within an hour, including one of the rare black ones. At our base on Ridge Creek farther south, the animals' keen sense of smell led them to climb to haunches of wallaby meat we had hung up, and their scramblings and occasional quarrels awoke us at night.

From all accounts, some form of epidemic disease, never investigated, carried off the animal in its wide variety of habitats on the mainland between 1900 and 1903, and it has never regained its former foothold. It soon disappeared from almost the whole of its range, with the notable exception of Tasmania. Rabbit traps, incidentally, are the bane of these little marsupials, and nowadays it is usual to find three-legged and even two-legged dasyures stoically carrying on to the best of their ability.

It is an extraordinary fact that along the Yarra Valley, right in the big city of Melbourne, a small colony still lingered, extending from Darebin Creek downstream to Studley Park. When we lived on Studley Park Road, a "native cat's" collection of booty was discovered beneath the front veranda! In May, 1931, and also on subsequent occasions, I spent vacations wandering about the basalt country of the Victorian Western District by Lake Corangamite, where another small remnant exists. Here, I searched by day and by night for traces of

the dasyures. It seemed high time that someone worked out this uncommon creature's life history; and the trials and tribulations that followed were really pleasant with the zest of expectation.

Under heaped-up boulders in this Victorian "last stand" area were "dining-lairs," which contained a wide assortment of sheep and rabbit bones. The presence of sheep skulls under the rocks was almost inexplicable, for in most cases they must have been dragged by the little animals from a slaughter yard half a mile away—all for the sake of a leisurely meal in seclusion. We cannot ascribe the work to a dog, because a dog could not have found room to enter the lair. Such a feat is all the more amazing when it is understood that the male ordinarily weighs only about 2½ pounds and the female 1½. The animals may

have dragged the material by degrees over a period of several nights, or possibly it had been brought closer by a larger animal. In captivity, dasyures show the same habit. They immediately carry delicacies, such as fish, to a sheltered spot.

These "native cats" seek lizards, small snakes, mice, birds, young rabbits, frogs, fish, and carrion as well as insects. About the King William Range and the button grass swamps of Tasmania, we found them feeding on burrowing land crustaceans (yabbies), which they caught at night at the hole tops. A black female dasyure I have in Queensland at present is showing a decided taste for the blue soldier crabs (*Mycteris*) of the mangrove flats, and of these there is decidedly no lack.

A well-developed nest-building instinct is present in *Dasyurus*



➤ A FLASHLIGHT PHOTOGRAPH showing two of the so-called "native cats" sharing bread and milk with a pair of brush-tail possums

quoll, though the females are the only ones that I have observed gathering bedding material—dry grass, bark, or scraps of hessian—which they carry in the mouth. They build a fairly comfortable bed in a hollow log, under a boulder, or down a rabbit burrow. In the Western District, one female with young was discovered in a grass nest under a heap of basalt rocks. She slept there rolled up in a vertical ball, with her head tucked into her abdomen in the manner of possums (*Trichosurus*). Another curious trait shared in common with some other marsupials is the occasional dormancy of the dasy-

► THE "NATIVE CATS" inhabit this kind of country in the island of Tasmania, south of Australia



◀ A MOTHER "NATIVE CAT," showing how the young still cling to their milk supply at nine weeks

ures when affected by the sudden cold of a frosty night.

Though they are all of the same species, these "native cats" are of several color types. The ordinary yellow-gray, white-spotted animal predominates. The uncommon black or melanotic type (retaining the pattern of spots) is present in the ratio of about one to twenty or thirty. In addition, there is a sooty-brown type, very rarely encountered. The only skin of this type I ever handled was nailed to a wall at Dreeite, Victoria.

As with many marsupials, the vocal sounds of dasyures are variations of a hissing cry. When the animals are at bay, one hears a low, prolonged, ominous note, fol-

lowed by several sharp hissing noises, while the jaws gape open displaying the sharp white teeth. Noises made by the larger spotted-tailed Tiger Cat (*Dasyurops*) and by the brush-tailed Phascogale are somewhat similar to this under like circumstances.

In the frequent nightly squabbles, which are seldom attended by actual damage, the characteristic far-sounding "Er-shish-a," be-

gun in a guttural tone and with pronounced and penetrating emphasis on the second syllable, may be repeated many times. In addition, short guttural coughing noises are suggestive of a man clearing his throat. Again the "Er-shish-a" cry, in a moment of intense quarreling, is begun with the guttural first syllable followed by rapid repetition of a second and very penetrating hissing note "Er-shish-

shish-shish!" etc.). These quarreling cries were well known to bushmen in earlier days, for in hundreds of cases the dasyures lived beneath the floors of huts, and their squabbling and bumping heads were familiar sounds at night.

In case you are wondering what type of armament the "native cat" carries, do not make my early mistake—unlikely, it is true,—of rushing along behind a spotlight and seizing a wandering dasyure haphazardly from the top of a stone wall. I did it only once! The animal certainly had teeth, and I received a particularly firm impression of them all!

After my early experiences with the animal at Lake Corangamite, I managed to breed it successfully a number of times. The first instance was naturally the most interesting one. Early in 1932, a male specimen of the black type was caged in an enclosure of moderate size with a normal yellow-gray female. "Furniture" in this darkened, comfortable little "flat" consisted of hollow logs, boxes, and warm, dry grass. The daily menu was as varied as it was possible to make it.

During April, May, and June of 1932, I made a regular inspection of the fairly quiet female dasyure in the hope that she might be having young. I wanted to follow all the details of the event. In April and May (approaching the Australian winter), the pouch area remained in its resting condition, being practically indistinguishable from the undersurface; but toward the end of the first week in June, reddish hairs were seen to be appearing in the pouch, while its forward ridge had become more prominent. In addition, eight teats were developing.

By June 13, the shallow pouch was quite conspicuous with its growth of reddish hair, and the teats were firm and pointed. I had hoped that I might witness the actual birth of embryos and see them pass to the pouch. Unfortunately, I missed the event only by hours. Early in the morning of

▼ A HUGE DASYURE, or "native cat," compared with an average-sized example of the rare black type. Both were caught near the King William Range



AUSTRALIA'S POUCHED "CAT"



◀ ANOTHER SCENE in "native cat" country in Tasmania. This is among the dolerite peaks of the Mt. King William Range

June 19, six minute offspring were already firmly established.

The eight teats were arranged in two series of four, roughly parallel, one set on each side of the pouch. It was found that four embryos were gripping the nipples of the animal's right side, while the remaining two were attached to the

hind teats on the left side. The front of the pouch at this time was extremely glandular and dotted profusely with white spots. The flesh-colored embryos in the curled-up posture measured only a sixth of an inch long (four millimeters), and each individual was contained in a tiny "pocket" or pit. The pouch

itself remained continually moist, and the mother sat up frequently to give it a thorough licking.

She was removed without delay from the enclosure to prevent interference by Father, who would find such "cocktail sausage" youngsters prime delicacy. At this time, the hind limbs, tail, and ears of each embryo were the merest of rudiments, while blue pigment spots marked the position of the future eyes. The tiny creatures showed little movement, being content to rest after their marvelous self-propelled journey into the pouch.

Growth, however, was fairly rapid, and by their third day, the embryos were almost twice their size at birth. Through their pink skins you could see their stomachs, with their bulging content of lacteal food. The mother submitted very quietly to handling, and her

▼ YOUNGSTERS at eleven weeks, clearly showing the black and normal types



care and licking of the pouch and its occupants was most thorough and constant.

By the end of their first week, the young dasyures measured almost half an inch (approximately eleven millimeters), about three times their size at birth. In addition, they were no longer passive, for there was decided movement of the stunted limbs.

On July 22, at the age of slightly more than one month, a number of interesting features were observed. On this date, when the mother was lifted from her nest, a faint, crackling, sucking noise indicated that the little jaws were gaining the power of movement. The joey on the upper left-hand teat was observed to be developing at a slower rate than its five fellows. It was distinctly undersized and less active. This is interesting in view of the fact that this little animal proved later to be the only male in the litter. Actually, in the adult stage the male is much bigger and more powerful. My experience with adult animals in the Western District seemed to indicate that males occurred in considerable excess over the females, but the reverse was certainly true in this litter.

The extraordinary grip with which the embryos hung to the teats was given a wonderful test at this time, when the mother chewed a small hole in the cage, just large enough to permit her head to push through. With immense difficulty, she then managed to squeeze the rest of her body, with the entire crowd of young dasyures, through this hole. Not one of them was dislodged, and we recovered the perambulating nursery without loss.

At this time, the infants were quite conspicuous, with their heads in the pouch and their bodies hanging out of it. By July 30, the faintest traces of pigment began to alter the hitherto pink bodies, appearing first at the head end. This took place at the age of six weeks, and soon the pattern of white spots was thrown into general relief.

At the same time, hair began to

grow on the bulky heads and on the shoulders, though the smaller male appeared at least a week behind the vigorous females in development. Gradually the fur and spots became more definite, and all the young animals were of the same grayish color, which at the time seemed to indicate that we were not to realize our hope of obtaining one or two members of the black type. The ears, though still small, were now taking shape, and the claws were definite and sharp. The forefeet possessed well-developed grasping powers. When the mother walked about at night, you could plainly see the bodies of the young ones hanging underneath. During daylight in the nest, the constantly moving tails and limbs attracted attention.

A significant stage was reached 65 days after their birth, when for the first time several of the short-furred, blind youngsters became detached from the teats. When the mother was lifted from them, they

uttered sharp anxious cries of "cha! cha! cha!" and crawled rapidly about the nest, clutching with claws and teeth at each other or at anything of a furry nature that came within the field of their blind search. This separation indeed indicated an important advance, for the mother had been heavily handicapped for over nine weeks in her search for food with the burden of six ever-growing young ones dragging along from an attachment in the pouch area. This says a good deal for the hardy nature of both mother and young. From the manner in which this particular female struggled about in a painful, hump-backed position, it was most evident that she was far from being at ease. It is very probable that in the wild there may be considerable mortality a week or two before the mother is freed of her burden. In her nest, she would hurriedly rake any straying youngsters beneath her with vigorous scraping motions of forepaws. Within a few seconds,

▼ HERE AT TEN WEEKS, the mother is carrying several of her babies in the "upper berth," while the rest are dragged along underneath in dining car



each offspring would then attach itself to a teat, and from these positions it was almost impossible to dislodge them. If the mother was then lifted up, the six large offspring would simply hang to the elastic teats, and they dragged over the ground whenever the mother attempted to run away. The only effective means of detaching a youngster was to plant a thumb firmly over its nostrils until it opened its jaws for a gasp of air!

All the young ones had shown the same grayish hue up to this time, but on August 28, at the age of nearly ten weeks, it was plain that three of the females were becoming darker. Certainly black fur was appearing on the heads and gradually spreading backward. Within a week, the contrast in color between the two types was quite pronounced. We had melanotic animals after all!

At the same time, the other three dasyures became a more vivid yellow-gray or yellow-brown.

The small parent was a devoted guardian. Though she occasionally left the bunch asleep in the grass nest, she rarely failed to return quickly at the anxious and insistent cries of "cha! cha!" or "shish! shish!" of a lost youngster.

On September 7, at the age of eleven weeks, the joeys' eyes were open for the first time, and the lone male was almost equal in size to the others. They showed an amazingly fast transformation as they took an ever-increasing interest in the world that had become visible to them. Occasionally, almost as a habit, they clung to the teats while the mother moved about, but now at twelve weeks of age, when disturbed, they usually clung with a bulldog "tooth and claw" grip to the fur of her side and back in the same manner as the young of pouched mice.

At thirteen weeks, they began to make furtive excursions away from the mother's side while she slept in the daytime. They did not bite, but six little jaws would gape threateningly and a few ridiculous scolding cries were heard when my

hand approached the nest. If they were placed on the ground, the young animals would anxiously chase the nearest moving object. It was interesting to watch the whole batch rush at a young wombat, leap on its back, and immediately cling like glue to the astounded animal in the belief that they had found their mother.

In mid-October, at the age of some sixteen weeks, the young, though still suckling occasionally, were extremely venturesome and interesting. Accustomed to being handled, they were now simply smaller editions of the adults except for lacking the slight brush on the tail. The young male was now easily the most robust member of the litter, and the little animals were not slow to eat the mother's food. One evening when brought into a room, they lost no time in scenting out and devouring two newly emerged Gum Emperor moths hanging to the curtains.

Toward the end of October, all the young animals became quite independent and ceased to cling to the mother. They were entirely capable of a separate existence after four and a half months in her devoted care. Frequently after nightfall they were brought into a drawing room, and from the moment of liberation, they careened over the floor, about the couches, and up the curtains. They would also wrestle with one another for hours. The three members of the black type and the three yellow-gray animals offered a most striking contrast as they frolicked in the evening.

Marsupials may be primitive, comparatively unintelligent animals, but this particular species seems to compare favorably with members of the highest mammalian order. Tamed dasyures retain their playful habits in the adult period. The young ones displayed a habit of sneaking furtively up to small objects and then bolting erratically away with the tail held straight up. They would also sit upright with ears forward and forepaws pulled down on the chest in the typical

attentive attitude of the adult dasyure. They had a practice of wrestling in this upright position, chest to chest, reminiscent of the sparing attitude of kangaroos. These wrestling bouts were accompanied by attempts to bite each other's throats, but good temper was un-failing.

They delighted in chasing tennis balls about the floor and in leaping high into the air in pursuit of blowflies during the daytime. Like all members of the species, they loved occasional sunlight and basked in it for hours despite their nocturnal habits.

By the end of November, they were developing the slight brush on the tail, and it was difficult to distinguish the mother from her daughters. The young male, however, with his robust build and richer yellow color, plainly stood out among the others.

In this family and in several others observed, the excess of young females in litters was in strong contrast to the results of hunting and trapping with drop-door cages, first in the Corangamite district and later in Tasmania. Here personal experience, borne out by the observations of local people, has shown an average of at least ten of the larger and stronger males to a single female. Indeed, it is highly probable that quite a few females are lost each winter, particularly when they are forced to compete for food while crippled with the burden of young in the pouch. In Tasmania, several animals are fond of dasyures, including the so-called Devil, the giant Barn Owl (*Tyto castanops*), and diurnal birds of prey. Father dasyure is no gentleman and never supports his wife or children in any way.

The life span of the "native cat" seems to be no more than four to five years at the most, according to evidence I have gathered over the past twenty years. This helps to explain why, when once the species is ravaged by disease in modern days of settlement, it has small chance of a comeback.



5 minutes with a Praying Mantis

Glimpses of a slow-moving member of the insect world, which offers the photographer oddness of form and posture

A Photo Series by WILLIAM J. JAHODA

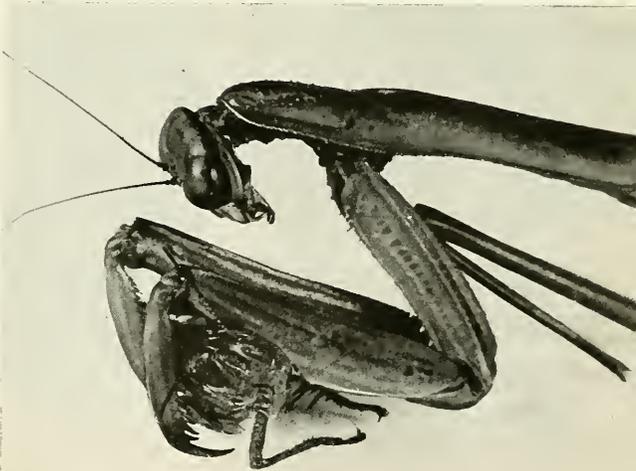
▲ ALL SET to snatch a drone fly or bee: a praying mantis on a calendula

➤ IT SEES the camera, an unfamiliar object in its world of leaves, flowers, and insects

▼ SOMETHING CAUSES the creature to descend toward the ground, perhaps the possibility of securing a cricket or grasshopper



▼ PATIENCE REWARDED: the mantis finds its meal





▲ "ANNA PURNA" brings to the screen a record of the climbing of a great mountain



▲ CLIMBERS must fight their way up under constant threat of avalanches and storms

➤ SUPPLIES had to be carried over bridges like this one

"Annapurna," produced by Marcel Ichac, narrated in part by Maurice Herzog, and introduced by Walter A. Wood, tells the dramatic story of the first mountain of its height (26,493) to be scaled by man," writes Mrs. Hilda L. Erlanger. Mrs. Erlanger herself is an active and enthusiastic alpinist, having climbed in various mountain centers of Europe during the past 28 years.

"Unlike Mount Everest, whose approaches have been explored for the past 35 years, Annapurna rises in virtually unexplored territory. The 1950 French Himalayan Expedition, under the brilliant leadership of Maurice Herzog, was a venture into the unknown. Much precious time and effort was spent in exploring the approaches and finding a route up the mountain. Because this was a first attempt, the French Expedition's success stands unique in the annals of mountaineering.

"The film vividly narrates the long journey to the icy wastes of Annapurna. Up there the winds never cease, breath-

ing becomes a major effort, man's strength wanes, and frostbite threatens. The expedition fights its way up perilous glaciers under the constant threat of avalanches and storms, and establishes one high camp after another.

"Unfortunately, films taken during the final assault were lost. We do not see Herzog and Lachenal on their summit climb, but we are shown a still picture by Lachenal of Herzog on the summit. He is holding aloft his ice ax with the French Tricolor, signalling their expedition's victory.

"The camera records their arrival at camp after their heartbreaking descent. They walk as in a trance, two phantoms half-frozen and snowblind. Seriously frostbitten, near death, the two men are transported down the icy slopes on toboggans. They are carried along precipices and across raging torrents on the backs of barefoot porters and borne on litters through jungles and monsoon rains. Almost daily amputations are performed on their frostbitten hands and feet, for gangrene had set in. Both men lose their toes,

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES





◀ "BENEATH THE 12-MILE REEF" describes the fast-passing sponge industry in the Florida Keys

▼ TERRY MOORE and Robert Wagner star in it



"Beneath the 12-Mile Reef"

and Maurice Herzog loses most of his fingers.

"The film shows us that the expedition to Annapurna and its return with the injured was an epic of human courage and strength of spirit. It is a superb narration of the incredible endurance of the French mountaineers, their Sherpas, and their porters, but above all, the fortitude of Maurice Herzog remains unforgettable.

"The scenic wonders and the ruthlessness of the Himalayas are vividly re-

corded, as is the bravery of all the members of the expedition.

"It was not in vanquishing the first of the Himalayan giants that Herzog and Lachenal won their greatest victory but in their agonizing journey back and their return to life. In spite of their injuries, both men have returned to their mountains. Maurice Herzog is shown climbing one of the high ridges in the Mont Blanc district, and so this beautiful and deeply moving film ends on a note of triumph!"

Brief comments on films previously reviewed

Documentary and Grade A

Conquest of Everest

One of the greatest achievements in the history of exploration magnificently filmed

The Living Desert

Disney's first feature-length True-life Adventure film, showing animal and plant life in the Great American Desert

Song of the Land

Series of excellent movies of various forms of wildlife

Tanga Tika

A story attempting to portray present-day Polynesian life

Down the Alphabet

Captain John Smith and Pocahontas

Unimaginative portrayal of the famous tale

Mogambo

Clark Gable as animal collector in Africa. Simple plot

What the Experts Said

Stirring epic from on-the-spot material

Marvels disclosed in this film must be seen before one can sense full significance

Framework on which picture is built will mean different things to different people

Takes an anthropologist to understand fully what the film is trying to do. Beautiful photography

A modern version of the story

Not truly Africa, although partly filmed on location. Gorilla action climax of film

AFTER hearing about some underwater scenes in "Beneath the 12-Mile Reef," we decided we had better take a look at it in the presence of a fish expert. The underwater footage was actually on the screen for not more than fifteen minutes, but for many it may well be the most memorable part of the picture.

In commenting, James W. Atz of the New York Aquarium says, "This motion picture presents some noteworthy scenes of marine life, and the wide screen of CinemaScope imparts additional realism to scenes beneath the surface just as it does to those above. One gets a real feeling of the incalculable magnitude of the world under water, as well as a good idea of the strangeness and beauty of the seaweed, fish, and other life of the reef. The film is marred by an obviously fake giant octopus with which the young hero grapples. In both appearance and behavior, this contraption gives but the poorest approximation of what a real octopus is like."

Mrs. Ethel Cutler Freeman, who knows this area well, attests to the authenticity of the scenery. "In fact," says Mrs. Freeman, "one gets the impression that one is actually sailing among the cerise mangrove Keys of South Florida or riding the swells of the Gulf of Mexico. I heard a man who knows these people well say that the ceremonies, manners, and customs as portrayed by the actors in this film rings true except for the acting of Terry Moore.

"A banal boy-meets-girl story does not always make a poor movie, as 'Beneath the 12-Mile Reef' proves. This film also tells the story of the fast-passing sponge industry and shows the unique and colorful folkways of the people of Greek and English descent who live in this area."

"Beneath the 12-Mile Reef" is a Twentieth-Century Fox Production.



▲ CAMPAS visit our canoe, Rio Ucayali



▲ CAMPA men making fire



▲ CONBO chief in traditional costume



▲ CONBO with beaded bib decorated with silver discs



With the Explorers

In the Jungles of Peru

Highlights of the second half of Harry Tschopik, Jr.'s expedition to the western territories of the Amazon

THE SECOND LAP of the expedition carried our party in the reverse direction to the first, that is, into the territory of the Campa and Conibo Indians on the Upper Ucayali River. Although downstream the worst recorded floods in Amazonian history had been raging, the Upper Ucayali was at low ebb, making it possible for us to visit and film several tribal groups of great interest.

As before,^o my companion, Raúl de los Ríos, and I traveled in a 40-foot motor-driven dugout, christened "Queen Mary de Amazonas." The occupants of the canoe included a mestizo mechanic, two Piro Indian boatmen, a Conibo pilot, a Campa interpreter, and a macaw, carried along as a mascot.

The first group we visited were the still uncivilized Campa, who occupy the swift-flowing tributaries of the Ucayali between the river and the foothills of the Andes. I had never seen a wilder lot. All were painted bright red, from the roots of their hair to their chins; and some of the older men were tattooed with black designs as well. Men and women alike wore night-

gown-like brown garments smeared with red paint and decorated with seeds, nuts, and toucan scalps. Even the babies were painted, and all of the men clutched their bows and arrows and stared at us.

Until today the Campas are the most feared warriors of the Montaña region. Although most of their wars are intertribal or are fought with other members of their own tribe, three years ago a group of Campas came out to the main stream of the Ucayali and massacred the passengers and crew of a large river steamer that was moored to the shore for the night. Our Campa interpreter had once been shot by a fellow tribesman, and he carried around an arrow in him for a year. Finally, he was operated on in Pucallpa for "appendicitis," and the surgeon removed five inches of the chonta palm arrow point from his abdomen.

However, the Campas are highly intelligent and proved to be thoroughly satisfactory movie actors. Although entirely unaware of what we were doing, they acted out complicated scenes before the movie camera with all the skill and flare of professional performers. During the filming of a fishing sequence involving large numbers of Indians, we found that we were short-handed. One Campa who knew some Spanish but had never been out of his native jungle learned to measure the distance for focusing and even to read and set the exposure meter.

When asked what they wanted in repayment for having assisted us with the movie, they all requested dogs. The Campas train highly specialized hunting dogs, some that will only track tapirs, others for wild pigs, others for jaguars, and so on. Later we sent a shipment of two dozen puppies by launch up river from Pucallpa.

The expedition next visited the Conibos,

who occupy the mainstream of the Ucayali as well as lakes and oxbows connected with it and who are culturally related to the artistic Shipibos. As a matter of fact, in some respects the Conibos even surpass their Shipibo relatives in artistic achievement. Their culture has been less influenced by the white man, and some Conibo pottery is about the best produced by any American Indians today.

At one Conibo village, we had the opportunity to witness one of the most important Conibo ceremonies and one that has never been described, since missionaries have done their best to stamp it out. The ceremony is given as a coming-out party when an adolescent girl is presented to the members of her group. The main feature involved is the sacrifice of some animals by archers dressed in painted garments and beautiful crowns of yellow feathers, their faces adorned with the down of white egrets glued on with red paint. Other men hold carved and painted war clubs. Everyone was dressed in his very best clothes, jewelry of monkey teeth, nose and lip ornaments. The faces, hands, and feet of all, including the children, were painted in fine geometrical patterns.

The pig was tied to a large painted balsa wood cross, and shot with arrows. Meanwhile, the small boys, in imitation of their elders, performed the same ceremony with a small cross and an unfortunate chicken.

After reaching a peak of excitement I have seldom seen equalled, the party ended with the women screaming and pulling hair and attempting to drag home their drunken husbands. Although our debutante parties are usually more refined, I have never been to one where everyone seemed to be having a better time.

HARRY TSCHOPIK, JR.

^oSee "Hot Off the Tape" in NATURAL HISTORY for Sept. 1953.—Ed.

The magic
whispers...



*When Grandpa tucked you between his knees,
you knew you were going to listen again to
his wonderful watch—to hear its magic
tick . . . tick . . . tick . . .*

*And as you listened, those measured whispers of
time shut away the world, leaving you close to
Grandpa, secure in his love.*

From fathers and mothers to sons and daughters passes
the lifeblood of happiness—security. The privilege of
providing it for those we love can be found only in a
land like ours.

And another wonderful thing is this: By realizing this
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of our country. For, think—the strength of America is
simply the strength of one secure home touching that
of another.

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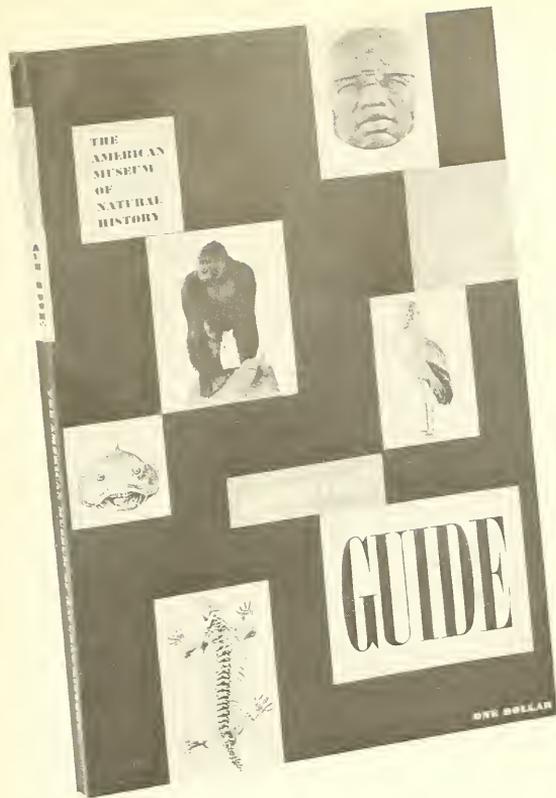
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will be set aside for you before you even draw your
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LETTERS

Still Champion

SIRS:

In Weldon Heald's article on record-breaking Sequoias, the present champion is said to be the General Sherman tree, which has a circumference of 101 feet and a height of 272. How, then, has Mr. Heald not found one to beat it when he tells of having seen many over 300 feet in height, with circumferences ranging from 90 to 100 feet?

A READER

New York, N. Y.

THE TALLEST TREES ARE USUALLY YOUNGER ONES WITH SMALLER GIRTH AND LESS BULK. THE TREES OF LARGEST CIRCUMFERENCE ARE OLD AND HAVE LOST 50 TO 100 FEET OF TOP. NO OTHER MEASURED SEQUOIA EQUALS GENERAL SHERMAN IN TOTAL BULK.

WELDON F. HEALD

Portal, Ariz.

Black Robin

SIRS:

One occasionally hears of a white robin, but has anyone observed a black one? I had this opportunity last summer, right in my own yard. The bird was mated to a normal robin of our local race, *Turdus migratorius caurinus*. Its sex was uncertain, but I believe the black robin was a female.

This robin was so dark that, except for the shape of its body and the appearance of the young birds, you would not have imagined it to be a robin. It was black above, and the few red feathers on the breast were so covered by black ones that they were invisible more than about a dozen feet away. Where standard robins are whitish underneath, this bird was medium slate-color. It looked entirely black at a little distance.

Other robins appeared to dislike the bird, and after the brood had grown to the point of being able to fend for themselves, the other robins chased this bird so much that it apparently left and has not been seen since.

I always look forward to the arrival of a new issue of NATURAL HISTORY.

PHILIP LEROY WEEKS

Vancouver, Wash.

The following comments are offered by Dr. John T. Zimmer of the American Museum's Bird Department:

The Robin, in common with various other species of birds, may sometimes appear in black plumage, but this abnormality is much less common than albinism. Records for the Robin are few but do exist.

Melanism is of several sorts. Where it occurs as a mutation, it could be preserved by selective breeding, if conditions permitted. In nature, however, it would probably be swamped rather promptly through interbreeding with normally colored individuals. Another sort of melanism has been produced in certain caged birds by emphasis on particular items in the



Photograph by John Marinus

▲ THE KING VULTURE lives in tropical America in dense jungles. Its nesting place has never been found. Fifty or more of these vultures sometimes assemble to gorge themselves at the carcass of a tapir. Brilliant but repulsive, the naked, wattled head is scarlet, orange, and blue, with glaring white eyes



▲ GRAND TETONS over Jackson Lake, Wyoming. Photograph by DON KNIGHT



birds' diet. It is questionable how frequently this may occur in the wild. The effect presumably would not be permanent.

Accidental melanism in birds that have no natural blackish variants, such as the Robin, is due to some physiological disturbance in the individual. Often it is only partial, with the black patches irregularly distributed, and frequently it is combined with partial albinism. The distribution of the melanin pigment is uneven, so that parts of the plumage are oversupplied while others are deficient. Robins have been reported that were at first of normal coloration, then molted into complete black plumage, and with subsequent molts acquired increasing amounts of white feathering. If Mr. Weeks' bird returns to his vicinity, it would be interesting to learn if it shows any changes of this sort.

Such abnormally colored individuals often are unpopular among their fellows, but sometimes they are able to find mates and raise families. Many of them, however, suffer ostracism if, indeed, not persecution.

The Clansman in the Cave

SIRS: William B. Sanborn's article on "The Monarch of New Cave" reminds me of the delightful and interesting visit I made to "New Cave" in the summer of 1937. The party included Mr. R. M. P. Burnett of Carlsbad, New Mexico, Dr. and Mrs. Bertrand Schultz of the University of Nebraska, and a party from the University of New Mexico. At that time, we called it "Slaughter Canyon Cave." While there were no gates to bar entrance, the cave was difficult to find unless one was well acquainted with the region. Mr. Burnett later discovered a fireplace within its vaulted ceilings, containing the bones of deer and fragments of pottery.

We have reason to believe that the discovery of the cave was considerably later than that of the now famous Carlsbad Cavern. Interested readers might also enjoy seeing the accompanying photographs of "The Christmas Tree" and "The

Clansman," which were taken by my son, F. C. Holtz, Jr.

FREDERICK C. HOLTZ

Springfield, Ill.

Readers may recall that both of the men mentioned above, Dr. Bertrand Schultz and Mr. R. M. P. Burnett, have written for *NATURAL HISTORY* Magazine and that Mr. Burnett actually wrote a short article on "New Cave" (*NATURAL HISTORY* for May, 1938) as a result of the visit mentioned.—Ed.

Wonders at Home

SIRS:

The arrival of *NATURAL HISTORY* is always a welcome event at our house and also to our best friends to whom it is passed.

I have enjoyed your magazine for many years without commending you, but I cannot help but tell you how much we enjoyed the unique and fascinating tale in the December, 1953, issue by Nell Murbarger, entitled "Our Largest Petrified Tree." It shows that we have interesting places to go right in our own country and do not have to go to Patagonia or such far places.

M. D. SCHIEFER

Cleveland Heights, O.

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THE COVER THIS MONTH

This is the portrait of a parrot about nine inches in length known to ornithologists as *Pionites melanocephala melanocephala*, or Black-headed Caique. "Dirty Face" and "Little Breecches" are among the names given it in various regions. Although said to occur widely in the Orinoco delta and adjacent lands to the south, it is seen seldom enough in captivity to fetch a substantial price in Ciudad Bolivar on the Orinoco River some 300 miles southeast of Caracas.

This particular specimen answers to the name of Lorito, meaning "little parrot," and has become an engaging pet with a dynamic personality. He does not talk but is nevertheless eloquent, and has a flair for comedy. He shows special pleasure by clucking, then undulating his neck and bobbing his head. He whistles a varied tune, cackles like a hen, screams like a sea gull, and mews like a kitten, according to his mood. He is fond of horseplay and often throws himself on his back to juggle a ball or miniature dumbbell with his feet.

The color photograph was made by Richard Finnie of Belvedere, California, writer and documentary film-maker.

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----- by Johannes Maringer
and Hans-Georg Bandi
in execution of a plan by
Hugo Obermaier

Frederick A. Praeger, \$12.50,
163 pp., 216 illus.

ASIDE from its intrinsic charm, the remarkable thing about the Art of the Upper Paleolithic is its appearance at so early a stage in human development. Seventy-five thousand years ago the Ice Age, or the Pleistocene, was entering its last phase; Neanderthal man had faded out of the picture; and *Homo sapiens* was everywhere succeeding him. These earliest ancestors of modern man lived in caves, used chipped stone tools, hunted wild animals for food, and by our standards existed on a very

primitive level. One might have anticipated that such primitives as these would have been capable of only the crudest forms of esthetic expression. But instead, we find them carving ivory, engraving stone, and painting murals of a very high order, with a sophistication that delights our own taste. Perhaps the peak of this first truly artistic era is the wall paintings. Done in reds, brown, black, and occasionally yellow, the paintings reveal an astonishing virtuosity and a sureness that in the telescope of time seem born in full bloom. Actually, of course, they cover many thousands of years and show a definite line of development, which is not without meaning for students of more recent art history.

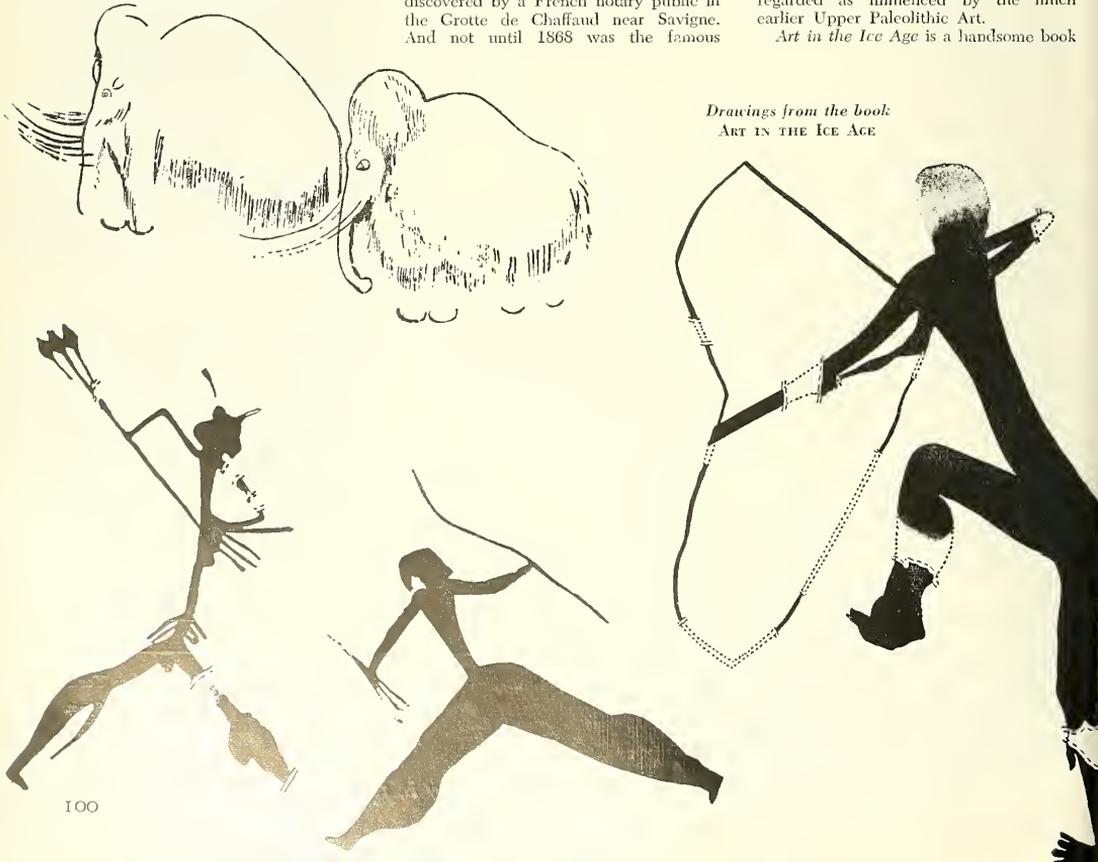
The survival of these magnificent and fragile examples for so many millenniums was due in large measure to the fact that many of the caves that were decorated had been sealed off for long ages from human exploration. In fact, it was only a little over a century ago that the first evidences of Upper Paleolithic Art were discovered by a French notary public in the Grotte de Chaffaud near Savigne. And not until 1868 was the famous

Altamira Cave near Santander in Spain, with its splendid animal paintings, first explored. One of the most recent of these illuminated caves, and perhaps the richest, is Lascaux, which was stumbled upon accidentally by two boys following a curious dog.

Art in the Ice Age presents a fine series of illustrations of this art, rendered both in black and white and in color. The authors, Johannes Maringer and Hans-Georg Bandi, are students of the late Hugo Obermaier, who was one of the leading lights in European prehistory and an authority on its art expression. They have followed in the text and general design of the book a plan conceived by Obermaier. This is indeed a labor of love for which all of us must be grateful.

In addition, the authors have also covered with admirable illustrations and text the Post-Paleolithic Art found in the Spanish Levant and the so-called Arctic Art found in Scandinavia and northern Russia, dating perhaps as far back as the 6th millennium B.C. Both there are regarded as influenced by the much earlier Upper Paleolithic Art.

Art in the Ice Age is a handsome book



Drawings from the book
ART IN THE ICE AGE

that should reward any lover of art and all students of man's past.

HARRY L. SHAFIRO

CRATERS OF FIRE

----- by Haroun Tazieff

Harper and Bros., \$3.00,

239 pp., 22 pp. of photos, 16 figs.

LAY observers, and wives, are sometimes reluctant to believe that the observation of vulcanism is no more hazardous than the pursuit of any other vocation. It must be confessed that the average vulcanologist makes no great effort to disillusion the lay observer group. It is far more exciting to portray one's self as an intrepid fire eater, and M. Tazieff does not deviate from tradition. Tazieff did, in fact, have some hair-raising experiences in the Belgian Congo and is lucky to have lived through his first exposure to flowing lava. The sudden appearance of a new opening on the flank of an African volcano afforded him an opportunity to observe one at close range. The interest thus whetted then led him, in the next few years, to visit Mt. Etna and Stromboli when reports of eruptions from those cones came after his return to Europe. Fast action, good fortune, and normal courtesy toward foreign scientists (a courtesy not shown other geologists by his Belgian compatriots) let him arrive at the sites while the fireworks were still in progress and enlarged his knowledge of vulcanism in general.

The account of vulcanism found in this book is largely a story of personal experience, though M. Tazieff has woven in enough facts about vulcanism and its causes to give the book some educational value. The author has not gone far into the theory and the problems of vulcanism; it is no textbook on the subject. At the end there are several appendices. One deals with the words commonly employed by the geologist, another is a short section of explanatory notes on volcanic theory, and the third an extensive, but far from complete, list of the names of volcanoes.

This book falls between a romantic and wholly personal account of the experiences of a typical geologist who has had opportunity to visit a few erupting volcanoes, and a real scientific work. It is neither an erudite account of vulcanism (it is extremely superficial, in fact), nor is it just autobiography. Appendix III, the list of volcanoes, is pure window dressing, for it is incomplete and inaccurate. (Mt. Mayon erupted violently in 1947 but is listed as having last been active in 1914, and Lamington, which killed a few thousand people in 1951*, does not appear at all. One wonders for whom the list is intended. Any expert could make many additions, and the casual reader doesn't care. Even if the latter reads of a new eruption in his morning paper and goes scurrying for his book, he is not likely to find it mentioned.

This complaint is raised, not because *NATURAL HISTORY Magazine, May, 1953, p. 216.

it is an important aspect of the book, but because the inclusion of the list gives an appearance of detailed accuracy and documentation to a book that is really superficial. One fears that it typifies the philosophy of the work. *Craters of Fire* should be read only as a personal account of what must have been a series of interesting and at times thrilling adventures, but they were undertaken only for the sake of the experiences. If M. Tazieff risked his life, no useful or scientific purpose would appear to have been served, for he approached his subject as an adventurer, not as a scientist. However, it makes a good story and a painless introduction to vulcanism.

F. H. POUHRI

THEY NEVER TALK BACK

----- by Henry Trefflich

as told to Baynard Kendrick

Appleton-Century-Crofts, \$3.50

246 pp.; 16 pp. of illus.

ANIMALS may never talk back, but they rarely submit to confinement without first putting up a desperate struggle to keep their freedom and are often very noisy. I was in Trefflich's animal store at Christmas. It seemed to me that there were hundreds of chattering monkeys, scores of barking dogs, innumerable singing canaries, and a host of other animals from all parts of the world, all vigorously voicing their desires for attention. Uppermost in my mind was not only the question of how could anyone bring together such a vast assortment of animals, but also how could the animals be fed and kept healthy.

Here in the fascinating story, *They Never Talk Back*, is a realistic insight into the intricate field of an animal dealer's life. Baynard Kendrick tells the exciting details of Henry Trefflich's adventures and of the many hair-raising experiences he has had on his hectic expeditions: Of a leopard that escaped on board ship, how young gorillas are captured, of tigers that got loose during an airplane trip, and of six elephants that nearly wrecked another flight. There are many other such dangerous adventures, including wrestling with a huge boa constrictor and the hilarious account of how 100 monkeys escaped from their cages and invaded Fulton Street in New York—visiting bars, fire stations, and joining in choir practice at a neighborhood church.

Dealing in wild animals is a risky business. Valuable specimens representing many thousands of dollars may suddenly die in transit, or the cost of procuring them may prove to be in excess of their market value. Henry Trefflich, we learn, had many such setbacks, which on more than one occasion wiped out his entire working capital. Now, he is one of the largest animal dealers in the world, and he represents a million-dollar business. His name is a byword in zoological parks, menageries, and pet shops. How he built up his business and reputation is an entertaining story in itself. Henry Trefflich has been associated with most of the great names that figure in the animal world. He tells a most amusing story of

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GEORGE C. GOODWIN

ERNEST THOMPSON SETON'S AMERICA

----- Edited by Farida A. Wiley

Devin-Adair, \$5.00; 397 pp., 22 illus.

THIS is the second book of American Naturalists Series edited by Miss Wiley. The first *John Burroughs' America*, was published in 1952.

Miss Wiley has contributed a brief account of Seton's life in the introduction, and Mrs. Julia M. Seton has written a preface, which she has entitled "Impressions." In these latter few pages we hear about Seton's home life and the great amount of work he accomplished, told by the one who knew him best, his wife.

The body of the book is composed of chapters taken from his vast store of writings. Miss Wiley has chosen these wisely. Both scientific and popular articles are included, among which are: "Birds of Manitoba," "Studies in the Art Anatomy of Animals," "Life Histories of the Grizzly Bear," "Moose," "Gray

Wolf," and the "Big Horn Sheep"—all from his monumental work *Lives of Game Animals*. Also included are some of his famous Indian tales and a privately published article, "The Buffalo Wind Calls Again." But to this reviewer, the most important of all are his stories of Krag and Lobo, which bring back pleasant memories of the first books he ever read from cover to cover. As I am writing this review, my eyes wander over to a book shelf and rest upon two books with well-worn pages: *Lives of the Hunted and Wild Animals I Have Known*. I cannot help but feel that these "Lives" had a strong effect on another life, unknown at that time to Ernest Thompson Seton.

The book is illustrated by Seton's drawings, and at its end there is a list of his books.

T. DONALD CARTER

THE WEB OF LIFE

----- by John H. Storer

Devin-Adair Co., \$3.00
144 pp.

IT IS surprising that we have had to wait so long for a book that would make available to the layman the basic facts about wildlife communities and how they live. The merit and weakness of *The Web of Life* can both be laid to the fact that Mr. Storer is himself a layman. His readable style and avoidance of the technical terms that characterize most ecological writing are the book's greatest merit. Unfortunately, his efforts to simplify and generalize have resulted in some statements that are either misleading or at variance with recent ecological research. While not serious from the standpoint of the casual reader, such errors will make it unacceptable for academic use.

The theme of the book is the complex and intricate interrelationship of all life. A description of the nature of the physical conditions that the earth's surface affords for life is followed by a brief resumé of the story of how life evolved. Today's wildlife communities are analyzed in terms of the role played by each plant and animal species living in them. What ecologists call succession—the tendency of every community to evolve from relatively unstable pioneer stages to increasingly more stable ones—is well presented.

Mr. Storer describes in considerable detail the life history of the five species of Pacific salmon and devotes a chapter to the discussion of the deterioration that has taken place in our western grasslands as the result of a century of overgrazing. Throughout the book, and especially here, he makes a strong plea for a better understanding of ecology. He also stresses the necessity for greater conformity to the laws of nature in our efforts to exploit natural resources. He points out that only in this way can we here in America hope to keep our soil and water resources unimpaired for the benefit of future generations.

RICHARD H. POUGH

THE MACMILLAN WILD FLOWER BOOK

----- by Clarence J. Hylander

Illus. by Edith Farrington Johnston

The Macmillan Company, \$15.00
480 pp., 232 illus.

THIS is a book of handsome appearance, and one's interest is captured at the very outset. This will probably be a favorable factor in promoting sales, for one suspects this volume has been planned for the "carriage trade," and it will need to be a good fifteen-dollars-worth.

More than 500 flowering plants have been selected from the wild flowers found in the eastern part of the United States, west to the Rockies, and north to southern Canada. These are treated in a systematic fashion, family by family, with common and botanical names, and brief descriptive text. The author has made a wise selection of the pertinent data most likely to be of interest to the average reader. The text is brief, however, and this can be so with no great loss to the reader because the illustrations convey the characters of the wild flowers much better than mere words.

The artist has faithfully portrayed the habit of growth, the texture and pattern of foliage, and the shape and color of the flower. Also, she has had the good fortune to encounter an engraver who brought this to the printed page so successfully that the color plates have the quality of originals. Some of this impression may be due to the selection of paper for the book. Text and plates are on the same stock, a dead matte surface. As a sample of all-around, quality bookmaking this is an excellent example.

This is a book to leaf over slowly, to enjoy and admire, to keep on a library table for others to admire, and finally to use for identification of wild flowers brought into the house. It is too big to carry into the field, and one should wash his hands before consulting it.

HAROLD E. ANTHONY

SEX AND THE NATURE OF THINGS

----- by N. J. Berrill

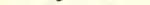
Dodd, Mead and Co.,
\$3.50, 256 pp., 44 illus.

IT should be said at the outset that there is nothing sensational about this book. The title should not mislead one to believe it is something to be read surreptitiously. Sex is like the weather in that it is with us always, but, unlike the weather, it is not as frequently a topic of discussion. This book, however, has the casual, albeit well-informed, approach to the subject, which keeps things in the proper perspective and leaves the reader with a good idea of how sex began, its purpose, and the many characteristics associated with sex. The author states he has written for the laymen and avoided the technical language of genetics.

The story begins with the imperfect knowledge of sex held by primitive man.

Continued on page 142

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WHERE TO RETIRE TODAY —AND ENJOY IT

by Norman D. Ford

If there is anything I have found out in traveling up and down this country and throughout the rest of the world, it is this. It costs less to retire than you may think it does—*provided you know how to discover those places where it costs less to live the kind of life you like.*

As founder of the Globetrotters Club I made it my business to find low-cost beauty spots all over the world. Right here in the U. S., I found places where the cost of living is surprisingly low—and you can get a part-time or seasonal job if you must pad out your income. Here are just a few of them.

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And in the rest of the world, there are hundreds more besides. Just a few of them:



NORMAN D. FORD

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So I say again—you can retire now, while still young enough to enjoy it—if you know where it costs less to live the kind of life you like.

—o—

(In the next column, read about two books by Norman D. Ford which tell you just this.)

TO RETIRE YOUNG ENOUGH TO ENJOY IT

—read these books by Norman D. Ford

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In Quest

DAWN would soon break. It had been a cold night under the canvas shelter 6000 feet above the South Pacific in the Central Highlands of New Guinea. My carriers were ready. We would for the eleventh time make our way over a slimy, worn trail to an island of trees growing on the steep north flank of the Kubor Mountains.

With a king's ransom in cameras, we stealthily approached our objective. Suddenly, the lead native stopped and pointed. A broken stick with half-wilting leaves "tepee'd" up in the path.

"Tambu. Bush kanak workem tambu," the lead boy announced, and there was a noticeable murmur among the men behind me.

I kicked the curious object aside, laughed, cajoled, and somehow convinced them that it had been nothing. And, indeed, the thing might have dropped from someone's armful of fagots. Anyway, why should anyone want to put a curse on me here in this seemingly peaceful pocket of neolithic civilization?

Arriving at the base of a tall grove, I made my way to a blind built like a six-foot table. In its roof were several round holes



▲ HENRY KALTENTHALER, expedition botanist from Philadelphia, constructing a 40-foot tower in the Kubor Mountains from which to photograph and observe the King of Saxony Bird of Paradise

➤ A NATIVE of the Kubor Mountains, Fio by name, examining a male Superb Bird of Paradise. Fio was a member of the 1951 and 1952 expeditions



BIRDS OF PARADISE

Adventures in one of the least-known spots on earth—a report from the American Museum-Armand Denis New Guinea Expedition of 1952

By E. THOMAS GULLIARD

*Associate Creator, Bird Department
American Museum of Natural History*



through which we could examine the limbs overhead. Like cats in the half-light, the naked men took their places of vigil, wrapped their arms around their shoulders, and shivered.

Tripods were set up, and a 400 mm. telephoto was mounted on an Italian Rectaflex camera. A 200 mm. telephoto was mounted through a reflex housing on the front of a IIIF Leica, and a Ciné Special 16 mm. movie camera with a 152 mm. telephoto was readied. A small tape recorder with a microphone was put into operation.

Wrapping a blanket around my shoulders, I settled back into a light camp chair to await the coming of day and to pray that Lady Luck would favor us.

It occurred to me that our actions must have looked strange, if not darkly subversive, to anyone who might have happened by. The matter of the curse flashed across my mind again. Indeed, I would be hard put to explain that all of this preparation was for the purpose of capturing a bird on film. Any normal citizen would have concluded, as the kanakas did, that we were long-long (crazy). I could scarcely expect them to believe that

➤ A LINE of 60 cargo carriers on their way out of the Kubor Mountains. Note the coils of rattan and bushrope, which will be used in the construction of a suspension bridge. The small pole bridge in this view is a typical cross-over used by primitive people in the central highlands





▲ NEWS OF THE EXPEDITION spread far and wide. This fellow walked three hours to have a look at the visitors. He wears a necklace of pig tails, mother-of-pearl shell, and mission beads; a nose reed; a forehead band of green scarab ectoskeletons; and a headdress made up of black cockatoo feathers and the plumes of at least three kinds of birds of paradise. The large black and white feather near the top of his headdress represents either a hybrid or an unknown species of bird of paradise

▼ CAMP ON MOUNT OMAR at 7300 feet, showing the expedition artist, Margaret Gilliard, making a water-color picture of a living King of Saxony Bird of Paradise. This is deep in the Kubor Mountains in an area where no white person had been before. Nevertheless, the explorers were usually surrounded by young boys and interested older persons who filtered out of the forest like ghosts

a bird had led to my outfitting, nine months before in New York, for 900 man-days in the remote New Guinea highlands—a venture so elaborate and self-contained that we had purchased ingredients, stoves, and ovens for the baking of 200 loaves of bread in lands rarely visited by white man.

All this was so. Our primary aim was to observe and photograph birds of paradise, chiefly the Greater Bird of Paradise, *Paradisaea apoda salvadorii*, under whose display tree we were now hiding.

Having come halfway round the world and having pushed our way inland to 5000 feet in the Kubor Mountains in the very heart of New Guinea, I was in no mood to let a curse deter me—not now, with success so near. As the light strengthened, my eye fell upon another broken cutting of leaves hanging upside down and crossed with a dead twig so as to form a kind of wilted letter A. I felt a chill run through me before this object of terror—of death. Beneath it was a painted shield three inches in diameter, with little triangles and squares and spots painted in red, yellow, and white. This was pushed into a cleft at the base of the tree—the bird of paradise display tree.

My Number One boy, Ti, spied





▲ GREATER BIRDS OF PARADISE, female and young on left, male on right. This is the bird that was collected in such enormous quantities during the height of the plume trade

the ominous sign as I stole toward it. He stepped quickly backward, thoroughly alarmed, and called his friends, who thereupon held a hasty "court," as is their custom. In a few moments, the brown men had dissolved into the gloom, but not before I had instructed Ti to "sing out" for my good friend, Maima, chief of the Kubor Mountain tribes, a man of great power. Together with my wife Margaret, who was here to sketch the birds of paradise, and Henry Kaltenthaler, expedition botanist from Philadelphia, we manned the cursed blind—not without some unkind swearing at the aborigines who had put the spell on us.

With cameras pointed like periscopes through the roof, awaiting the arrival of a flock of morning dancers, we sat back hopefully. If we could but get them in our sights! If we could blend a particular brand of luck involving light, bird behavior, and camera action, we would record, for the first time in history, a bird of paradise in its natural habitat.

Birds of paradise are among the most publicized birds in the world, but because of the difficult, disease-ridden terrain in which they live, they have been among the least-known birds. This, despite the fact that the first plumes to reach

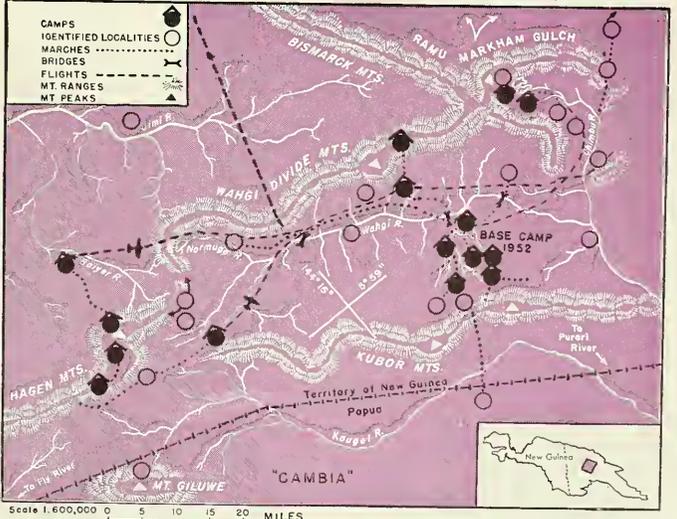
Europe were brought to Spain in 1522 by the survivors of Magellan's pioneer circumnavigation of the globe.

These feathers had been purchased from natives in the Molucca Islands. The birds of paradise embrace 42 known species. But they are restricted to New Guinea and its satellite islands, with the exception of two species that occur in northern Australia and two in the Molucca Islands, just to the west of New Guinea.

The great island of New Guinea, 1500 miles in length and 400 miles

in its greatest width, hovers like an ugly duckling over the back of Australia, its head facing the west, its mouth open as though ready to bite into Celebes and Borneo.

Native collectors, since before the dawn of recorded history, have collected countless birds of paradise for their own use, for barter, and for export to the millinery marts of Europe and America. More than 500 years ago the first specimens are thought to have reached the courts of Nepal, where they were and still are worn by princes and maharajahs. Others





▲ FATHER MICHAEL BODNAR, S. V. D., examining a forest *kapul*, a marsupial possum, which had just been brought down from high in the Kubor Mountains

▼ SUSPENSION BRIDGE across the Wahgi River below Kup. All but one of the expedition's carriers feared to cross the fragile structure and refused to carry loads on it. The mountain natives cannot swim



▲ SOME of the 400 skulls of small mammals collected from natives for scientific study. Glass bottles were used to purchase these. Like the American sportsman, the Chimbu hunter treasures his trophies





A CHIEFTAIN. Australian administrators maintain control through *tul tuls*, who wear brass shields on forehead. These men are expected to control the natives in their districts, and in return they receive a small salary



▲ House for cargo boys under construction. Four men can build such a house in two hours. The roof will be nearly a foot thick, and fire will be kept burning day and night, for it is cold at this altitude of 8000 feet. It will shelter a dozen men

reached the continent from outside the known world of that day, to be worn by Europe's reigning heads.

In 1924, plume collecting was halted by international decree. That year nearly 100,000 plumed skins of male birds of paradise were exported from the combined ports of New Guinea. Up to then, a major part of the island's economy had been based on the plume industry. Gold mining has now largely replaced plume collecting.

Entire towns, such as Hollandia, Port Moresby, and Lae, derived much of their income from the plume trade, and even today one comes on old-timers, such as Archibald Whitbourne at Bootless Bay and Mrs. Flora Stewart at Lae, who speak with nostalgia of this phase of pioneer New Guinea. Then plumes were brought to the coast by natives, to be bought at Moresby and Lae for £1 a bird for the Greater Bird, £25 for the Blue Bird, £2 for the Stephanie, and half a pound each for the Twelve-wire and the Red King. In Europe these plumes were literally worth their weight in gold.

Despite this long commercial ac-

quaintance, civilized man knew little about these beautiful creatures, other than that they lived in the deep forests, usually far up on virtually inaccessible mountains. The inaccessibility of their habitat contributed to the mythology that surrounded them. Foremost was the belief, in the sixteenth and seventeenth centuries, that birds of paradise were footless creatures that had accidentally wandered into this earthly world from some heavenly paradise. This arose from the fact that the giant flank plumes seemed to spring from the same part of the body as the legs do in ordinary birds and because in the native method of preparing the plumes, the legs were, and still are, severed from the skin. Curiously, even today, the scientific name of the Greater Bird, as given it by the ornithological sages of that distant day, is *apoda*, or, in our vernacular, "footless," the footless bird of paradise.

It is surprising how few white men have observed birds of paradise in the wild, and only a few of these have left any written record. Of the latter the first and fore-

most was the great Alfred Russel Wallace, pioneer explorer-naturalist of the Malay Archipelago, who, in the Aru Islands, observed them in strange arboreal dances. For nearly a century, few observations of any significance were made. Then, in recent years, came the excellent work on the Magnificent Bird of Paradise by Dr. Austin L. Rand^o, co-leader of the American Museum of Natural History-Archbold Snow Mountains Expedition to Dutch New Guinea.

In 1950, the writer led an expedition into the zoologically unexplored Bismarek, Hagen, and Kubor Ranges in the heart of the Mandated Territory of New Guinea and collected over 1000 specimens of birds between the altitudes of 5000 and 13,000 feet. These represented 182 different kinds of birds, of which 19 were new subspecies and 1 a new species. It is doubtful that such a magnificent haul of new birds will again be taken anywhere in our shrinking globe.

In New York, when the ornithological wealth was appraised and

^oSee his "Courtship of the Magnificent Bird of Paradise" in *NATURAL HISTORY Magazine* for March, 1940.



◀ HENRY KALTENTHALER with a battery of high-powered cameras and sound recording equipment, ready to go into action as soon as the birds of paradise appear

▲ CARRIERS RETURNING with a valuable cargo of birds, many unknown to science which the expedition collected in the visible cloud forest in the background right. This is the Wahgi Valley, looking south

new names were applied to the strange birds, every effort was made to obtain backing for an expedition that would go into the bush for the express purpose of studying and photographing birds of paradise. Almost unbelievably, we had found the home grounds of such rare species as the King of Saxony Bird of Paradise, the Magnificent Bird of Paradise, the Superb Bird of Paradise, the Blue Bird of Paradise, the Gardener and Lauterbach's Bowerbirds, and a new species, the wonderful Sanford's Bowerbird. The latter we named for the 1950 expedition sponsor, Dr. Leonard C. Sanford, who had long been in the forefront of the ornithological exploration of the Pacific. Some, though long known from trade plumes, had, till now, remained completely "lost" in their mountain retreats. Most important from the point of view of photography, dance trees of the Greater Bird of Paradise had been located in the recently discovered Wahgi Valley.

Armand Denis, famous explorer, lecturer, and moving-picture producer, decided to finance and lead a joint expedition with the American Museum of Natural History to revisit these remote forests. With

his talented wife Michaela, it was his desire to make scientific and commercial films of the colorful natives, who wielded stone axes and seemed not far removed from cave dwellers of an eon ago. Also, and most important to the Museum, the bizarre birds would be studied and photographed scientifically.

The writer was commissioned to manage the expedition. Photography of birds in their natural surroundings in the cloud forests of New Guinea had more than once been declared impossible. The last time had been in 1950, when European experts gave it as their considered opinion that to attempt to work under such adverse conditions would be foolhardy.

In order to give us the best possible chance for success, the National Geographic Society trained and equipped the author with the finest of photographic equipment, including waterproof, portable stroboscopic lights.

Letters went out to friends and acquaintances all over the island, in Papua, in the Mandated Territory comprising the northeastern half of New Guinea, and in Dutch New Guinea, the western half of the island. These contained urgent requests for information concerning

dance trees of birds of paradise. All were fruitless. So we followed the writer's original plan to return to the remote Kubor Mountains for our all-out effort to record the birds of paradise on film.

This we did, reaching Kup on March 28, 1952, after a long flight from Lae by way of the troughlike Markham Valley, thence threading dangerously through high passes in the Bismarcks — comprising the Central Divide—and dropping into the recently discovered Wahgi Valley. There we found a pioneer missionary, the Reverend Michael Bodnar, S.V.D. He lived on a flat-topped lobe of land sticking out from the side of the Kubor Range. In 1950 this "Robinson Crusoe" from Duquesne, Pennsylvania, had helped us on our way into the unknown interior, where wonderful discoveries were made—some involving birds new to science but, most important, some involving the discovery of rare bird of paradise courtship grounds. Through him we encountered a wild-eyed, powerful mountain native named Maima, chief of the Omong River tribes. Maima had led us into valleys never visited by white man and instructed his people to help us in many invaluable ways. In



◀ A "NEOLITHIC" MAN with his treasure, a steel ax. Warriors like this one well remember the first white man to enter the region, prospector Michael Leahy in 1933. They fought intrusion by the white men with much bloodshed but eventually calmed down and accepted the changing way of life

▲ A NATIVE HUNTSMAN on the Omong River wearing a *tambu* crown, cassowary plumes, and the long black plumes of the male Stephanie Bird of Paradise

time, I had come to feel a deep and warm regard for him. We were "one-talk," as is said of brothers.

We built a base camp of sixteen grass thatched houses, stored two plane-loads of food in a barricaded house, then began our travels. Nine camps were made, one at a distance of 75 miles, the rest within two days' walk or less. These were wet, uncomfortable little bivouacs but livable because of the knowledge that there was a comfortable base camp to fall back on.

By great good fortune, three display trees of the Greater Bird of Paradise were found. These were wired with stroboscopic lights on 90-foot cables. The electronic equipment, consisting of 6 power packs, each producing a 2000-volt, lightning-like charge, was activated from a single automobile battery. Four such batteries and a gasoline charger had been flown to the Kup base camp.

It had been my plan to wire many display trees so that I would only have to plug in my portable power units to fixed electrical outlets at ground level. I could then retreat to my blind and work my synchronizing Leica with its magnificent 400 mm. telephoto lens. In theory, I could thus make full-

color photographs of dancing birds of paradise at 1/5000th of a second. Was not this a photographer's dream? But, alas, although the equipment worked and was used in many other ways, the birds of paradise shied from the strob lights, which were placed nineteen feet from the dancing limbs. Three lights were necessary. These were camouflaged as much as possible, but of course I could not cover the glass.

Birds of paradise, we assumed, would soon learn as most birds do to ignore the lights if left in place for a while. However, showing their close relationship to crows, they proved heartbreakingly wary. Though we maintained month-long vigils, they rarely if ever revisited a tree after it was wired. In desperation, we devised other methods of photography in the effort to overcome the idiosyncrasies of these bedazzled crows. No effort was spared to achieve our objective. We walked literally hundreds of miles in search of dance locations where natural sunlight could be used for photography. We found two. The best of these perches had now been cursed.

Beneath this tree, I now sat in silence, looking at the *tambu*, the

symbol of death. I wondered how serious the matter was. I wondered what I had done and what my good friend Maima would say when he arrived. Surely he must be on his way. The voice grapevine had conveyed my urgent request an hour before. Like rolling thunder, the call had been transmitted from voice to ear to voice—a constantly renewing echo—until it reached Maima in his low, smoky hut.

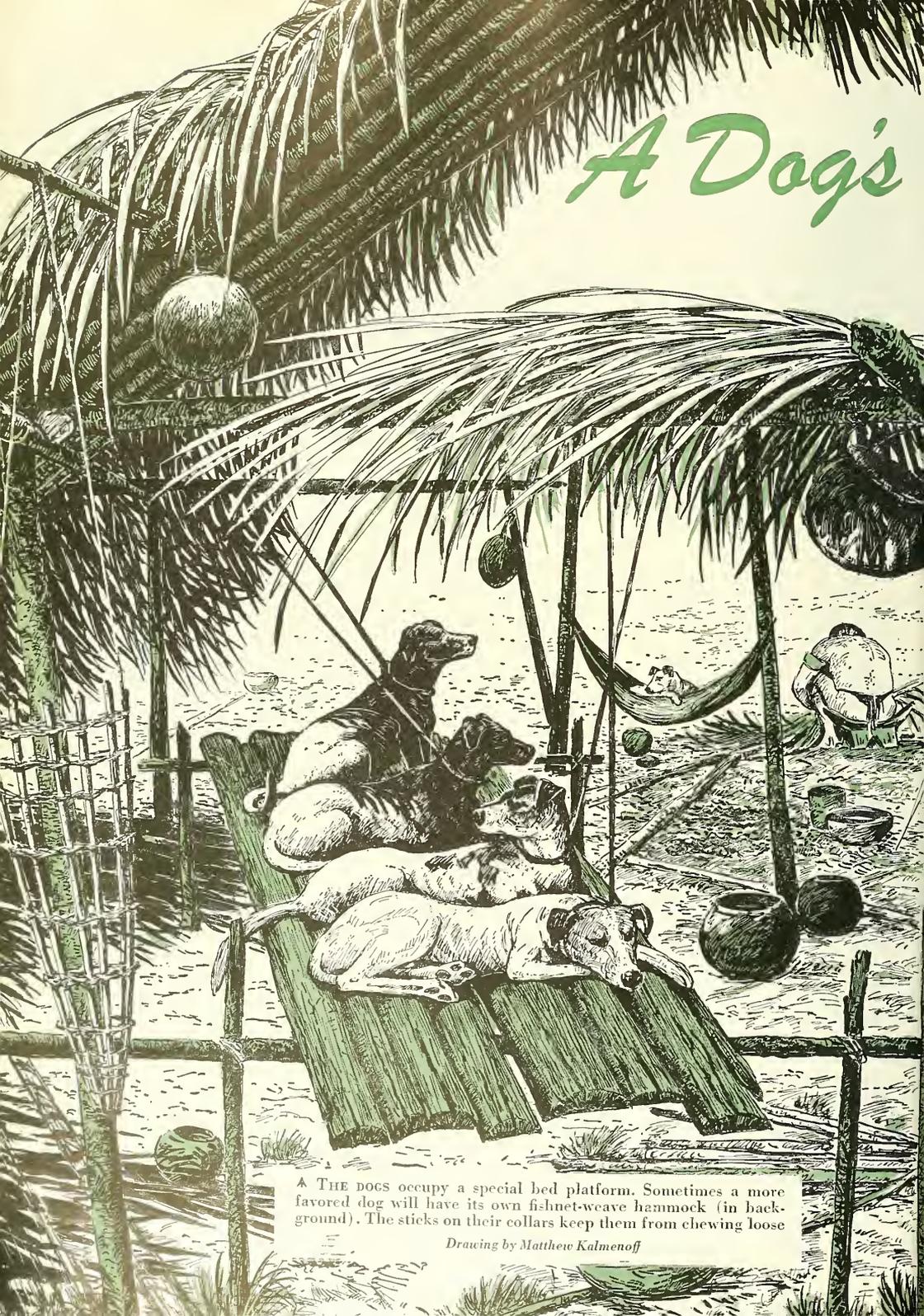
A mixture of Papuan, Polynesian, and Negro stock, the Waligi native is handsome and unspoiled. He still fashions stone axes in the deep interior of the Kubors and is, on the whole, as he was in 1933 when discovered in his hidden valleys. Much of his realm is still completely uncontrolled. Murders are few, although within a mile of my station under the display tree, intertribal murders had persisted until two years before.

The Australian administration has been good and the local patrol officers firm and fair—and with a reputation of always getting their man. They *have* had to get a few! Seven Europeans were killed within two years after the discovery of the Waligi Valley.

News of gold 50 miles up-valley at "Kuta" set off a rush of pros-

Continued on page 140

A Dog's



A THE DOGS occupy a special bed platform. Sometimes a more favored dog will have its own fishnet-weave hammock (in background). The sticks on their collars keep them from chewing loose

Drawing by Matthew Kalmenoff

Life among the WAIWAIS

The world's most pampered pets are gentle as lambs to their masters but vicious beyond words toward strangers

By NICHOLAS GUPPY

All photographs by the author

ON recent trips for the Forestry Division of the British Guiana Government, I found what I believe to be the world's most pampered pooches. They belong to the Waiwai Indians, a primitive tribe living in the dense forest of southern British Guiana near the headwaters of the Essequibo River.

These happy hounds scarcely set foot on the ground during the course of a normal day. Most of the time they lie on special platforms around the inside walls of the houses or even recline in their own individual hammocks. Twice or thrice a day they are taken down to the river and bathed so that they won't suffer from the heat. One sees them being carried, shivering and sneezing, back to their perches, where they are safe from chiggers, the burrowing fleas that can cripple a man or beast. Puppies and favored dogs, which may be very heavy, are always carried, often for miles, and usually in the peculiar manner shown in the photograph, which is apparently comfortable to all concerned. When occasion arises, a dog howls and is led away into the bushes—house manners are per-



➤ THEY are carried like this on long trips. They are perfectly house-trained and are led into the bushes periodically

fect. And on festive occasions the dogs are painted in red stripes like their masters.

In return for all this, these dogs give warning of the approach of evil spirits and strangers. The villages have no defenses against attack except their isolation (population is about one individual to fifty square miles), and these dogs, though they may be gentle as lambs to their masters, are the most vicious brutes alive to someone they don't know. They are also wonderful hunting dogs, famous throughout the region. In neighboring tribes, a Waiwai-trained hunting dog may be one of man's most prized possessions. I have seen two of these dogs rush into a herd of peccaries, single out one, and harry it so that in a few minutes it took refuge in a hollow tree, where it was speared to death by a Waiwai. When a jaguar is cornered and striking at the attacking hounds, these dogs must know what lies behind them so that they can leap out of harm's way, and their long curly tails serve as antennae, or feelers. As one Indian said to me, "Short-tail dog no good. He jump back and hit tree. Jaguar kill he quick."

Most Indian hunting dogs are kept skeleton-thin, but the Waiwai

dogs are always in excellent condition. I have never seen one struck hard, though the most appalling threats, with shouts and raised sticks, are frequently made against a dog that misbehaves.

As soon as a puppy is born, it is washed in an infusion of roots to make it strong. If its mother dies or is weak, it may be suckled by an Indian woman. And from then onward till the end of its life, it is an adored pet.

These dogs form a fairly homogeneous breed. They are short-haired with long curling tails, rather like slender fox hounds in appearance and with the same irregular blotching of black or brown on white. The Indians possessed them when discovered by Schomburgk in 1837, and like the dogs of all redskins in America, their origin is a mystery. It is my belief that they were brought to the Upper Essequibo by the Tarumas, a once great tribe, now almost extinct, who originally obtained them around the year 1670 from the Portuguese at Fortaleza da Barra, where Manaus now stands. But whatever the origin of their pets, it seems that we have in the Waiwais a race of dog lovers more extreme in their devotion even than the most civilized peoples of the world.

▼ YOUNG WAIWAI HOPEFULS, born with "a silver spoon" in their mouths



By
MASON WOOLFORD

IF there were but one apple tree in town, I'm sure everyone would flock to see the wonder of its blooming. And so it is with the Shaving Brush Tree, even in this place of horticultural marvels, St. Petersburg, Florida.

I doubted half of what I had heard about it; and when I finally saw it, I could scarcely believe my eyes—and ears.

When my wife and I drove up there that night, we found cars parked all along both sides of the street. People were standing about in the semidarkness, all gazing upward. Small floodlights had been placed around, and many of the spectators had flashlights pointed up into a weird sort of naked tree.

"What's going on?" I asked one of the watchers.

"Just keep looking," he advised. "There! That one! See?"

Look we did, and what we saw kept us enthralled for an hour or more.

The tree is perhaps 30 feet high, with a good husky trunk and limbs and branches that go up and around in a nice, spreading manner. Its bark is smooth and gray, and it hadn't the slightest sign of a leaf at the time of its blooming—no evidence of life aside from these amazingly beautiful blossoms.

As we watched, one of the swelling buds actually opened with an audible "plop" and spread out a cockade, a pompon, an eight-inch brush of golden-tipped coral filaments.

The absence of foliage made the

Shaving Brush Tree

You can both see and hear this
incredible tree burst into bloom

whole effect more weird. Every twig ends in a bud that grows out into what reminded me of a fat cigar in a stubby holder. Then, quite suddenly, the cigar "pops" open and curls back in five sections. And I do mean "pop." That was one of the things I couldn't believe until I saw and *heard* it.

The next morning I rushed back with a camera, hoping for a good picture. But, alas, the flowers were already falling off. Anyhow, I caught one as it fell and managed to get it into focus. I forgot to say that the tree only blooms at night, starting its grand performance shortly after dusk, and in the morning all the blooms fall off. This keeps up for about a month, I'm told.

Then I managed to find out a few facts about this astonishing tree. Briefly, it is native to Mexico and Central America, and the one I watched had been flown up to the Government Station, Chapman Field, at Coconut Grove, whence it found its way to St. Petersburg. It bears the imposing name of *Pachira fastuosa*, is a member of the Bombax family, and a close relative to the commercial kapok tree. There are other species of *Pachira* in Central and South America, but I'm quite sure there couldn't be many other genera of trees whose blossoms quite compare with the Shaving Brush.

Anyone who happens to be in St. Petersburg in April can see this remarkable performance for himself.

THE SHAVING BRUSH TREE

▼ WITH AN AUDIBLE "POP," the tree produces its shaving brush

▲ THE TREE is native to Mexico and Central America, but it can be seen (and heard) in St. Petersburg, Florida, any April





▲ DELICATE CASCADES of ice water enhance the mouth of Paradise Ice Caves and add their flow to Stevens Creek raging out of the tunnel



▲ THIS PASSAGE is dark and dangerous. Giant blocks of ice obstruct the way, and the rampant river flows from wall to wall, filling the cave with its roar

under

The Paradise Glacier

Discovering the unworldly beauty of Mt. Rainier's Ice Caves

By RUTH KIRK Photographs by LOUIE KIRK

INCHING across one last snowfield, my husband and I neared a long-anticipated goal. The Paradise Ice Caves had lured us for six months, since we first heard of their dank loveliness.

"It's not far now," Louie called, "but wait there while I chop some

more footholds." His voice barely carried over the sound of a boisterous stream 50 feet below us.

I kicked a level spot in the snow and eased the pack from my shoulders. Ahead of me, Paradise Glacier wedged itself between mountain crags like a giant frozen river; a

pale September sky arched above. Behind, the high glacial valley sloped swiftly to forested lowlands; the jagged Tatoosh Range thrust up beyond, and 12,307 foot Mount Adams reared in the hazy distance.

Louie shouted for me to come on. I scrambled down to stream level,

rounded a corner, and breathed an awed "Oh-h."

The twin mouths of the Ice Caves yawned 20 and 25 feet high. Stevens Creek raged from the dark depths of one; the other opened on a fairyland tunnel delicately scalloped—and blue! A vibrant blue, bright with an even, neonlike glow.

"What makes it like that?" I whispered to Louie.

"It's sunshine diffusing through the ice," he answered. "The glacier is thin above this part of the caves, and only the blue end of the spectrum filters through."

The floor of the main gallery was part ice, part gravel. A small stream cascaded along one side; water dripped everywhere. A melt-pattern of alternate humps and hollows textured walls and ceiling, toning the radiant blue. Indigo bands streaked through the ice; crystal-clear panes sealed occasional cups.

About 65 feet from the entrance, we came to a side passage that ran 25 feet to an opening banked with snow and veiled with melting water. The cave was 30 feet wide where the two tunnels joined and twelve feet high.

Beyond the junction, the tunnel seemed to continue uniformly, but it was dark and resounding with the stream's roar.

"If only we had a lantern," I remarked to Louie. "Wouldn't it be interesting to see how far this passage goes? Do you think it opens up more?"

"It might," he speculated. "But the only way to find out would be to follow it to the end. And we can't do that without a light. Let's go see how far we can get in the tunnel the creek flows out of."

We retraced our steps, jumped from rock to rock across the stream, and went into the second gaping cavern.

The first tunnel was beautiful, but this one seemed dark and forbidding. No blue ice; no intricately melt-etched walls.

An immense chunk of ice obstructed our way; overhead, cracks outlined another glistening block about to fall. There was only a narrow bar of sand between tumbling Stevens Creek and the ice of the cave wall. The air was wet and cold, the stream rampant.

We worked along for 40 or 50 feet, then gave up.

Outside once again, Louie pointed out a series of gravel ridges rising like big benches from the rocky valley floor.

"Those are small eskers," he told me. "They are floors of old ice caves. Streams flowing under the ice deposited sand and gravel, and when the ice melted away, the former cave floors were left as mounds. Paradise Glacier has been melting back for years, and caverns continually form and re-form at its lip, where streams emerge."

"You mean that the Ice Caves aren't always right here, or this size?" I questioned.

"They're different each year," Louie answered. "They start opening up about July, and they grow as warm air moves through the passages, melting back the walls. Eventually, of course, they melt so much that ceilings collapse; that's part of the retreat of the glacier."

"Do any other glaciers on the mountain have caves?" I asked.

"Sure. In fact, most do," he said. "Melt-caves like these open at the lower ends of inactive glaciers, along streams. Moving glaciers often form pockets where the ice passes over projecting ledges. Of



◀ GAPING TUNNELS like this one change from year to year as the glacier advances or retreats and as the subglacial water shifts its channel

▼ FOR ITS FIRST 30 feet, or gallery glows with a neonlike blue, produced by daylight filtering through the thin glacial ice overhead





▲ A MELT PATTERN of alternate humps and hollows is woven into the ice of the walls and ceiling



course, glacial caves aren't stable; they come and go."

Paradise Glacier is one of 26 that mantle Mount Rainier; the greatest single-peak glacier system in the United States. The total ice surface on the mountain is so great that if it were a ribbon 100 feet wide, it would stretch from San Francisco almost to New York.

Crevasse and treacherous slopes make going on the glaciers hazardous. Ropes, ice axes, and crampons (two-inch steel spikes worn on boots) are indispensable even for experienced climbers; so is knowledge of how to use them effectively.

But it isn't necessary to be a mountaineer in order to get ac-

quainted with the glaciers at Mount Rainier.

Roads and trails lead to views of the great ice masses at work sculpturing the mountainside. Pavement each year brings 300,000 visitors within a mile of the Nisqually, an active glacier. Many hike to its snout; others drive on to view it from paths along the brink of its glacial gorge. The Emmons Glacier, largest on Mount Rainier, is a spectacular sight from the Yakima Park Highway.

Trailside exhibits placed by the National Park Service tell the story of the glaciers; naturalists and rangers are glad to give additional information. And for the hardy few who want to venture out onto the ice, guide service is available at Paradise Inn.

For years the glaciers have been melting back faster than they are replenished with snow. Each year, 50 to 75 feet of ground, ice-covered for countless centuries, is laid bare. Glacial advances and recessions are

not fully understood, but probably the local pattern is an alternating ebb and flow. How long the present retreat will last cannot be predicted.

Noticeable changes have occurred since white men first knew Mount Rainier. Records of the Nisqually Glacier indicate that it has receded a mile since 1857, when Lieutenant A. V. Kautz noted its position at the time of the first attempt to ascend the mountain.

The thickness of the glaciers is changing as well as their length, Aubrey Haines, a park ranger, told me. "Take Paradise Glacier, for example," he said, "It averages 150 feet thick now, but 43 years ago it was at least 350, possibly more in places."

"What about the Ice Caves?" I asked. "Have the changes in them been recorded?"

"Oh yes," Aubrey explained. "For instance, there used to be tunnels where the Paradise River flows from the glacier. Tourists were

Continued on page 110

THE rain had stopped, and we were breaking camp. We stowed our equipment in the canoe and were ready to paddle across Lake George for the mainland, when suddenly I remembered something. I headed back for the dense pine-and-oak forest of the island in the upper part of New York State where I had camped for two weeks.

At last I found the spot I was looking for—an abandoned garbage pit. The organic matter formerly deposited in it had long since vanished—reduced to its basic chemical constituents by organisms in the soil. I dug about a half foot below the surface, scooped up a handful of the rich, light-brown earth, and let it sift slowly through my fingers. It looked inert and lifeless, but I knew that it was literally teeming with a vast, although invisible, array of microorganisms—a mysterious microcosm of bacteria, spores, mycelial threads of fungi, actinomycetes, protozoa, and other creatures. In this weird universe, many

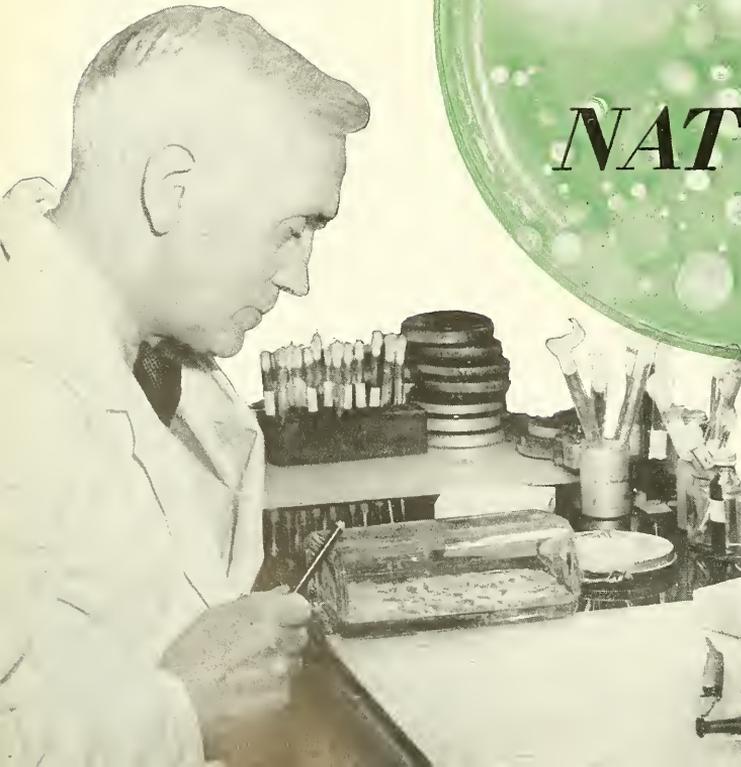
organisms were living together in mutually profitable partnerships. Others were parasitizing various hosts but perhaps were being themselves parasitized by other organisms. Still others were releasing chemical weapons to fend off attacks by their foes or to decimate competitors for living space and food.

I carefully poured a teaspoonful of this soil into an envelope to take back with me to Brooklyn, where it had a certain mission to fulfill. Nurtured by skilled hands, it would go through a wondrous series of processes, and from it would emerge a strange forest of lush colonial

growths. And perhaps all the organisms produced would be ruthlessly discarded. On the other hand (though it would be a spectacularly outside chance), one or more of these microorganisms might yield a new antibiotic—a weapon against germs not yet conquered.

Everyone now has heard about antibiotics, and the name penicillin is a household word throughout the world. We all have witnessed the dramatic effects of the "miracle drugs," either on our own illnesses or those of our friends.

But most people probably believe that antibiotics were not even dreamed of until Sir Alexander



NATURE'S ou

◀ DR. ALEXANDER FLEMING was an obscure researcher in a London hospital when he discovered penicillin. He noticed that bacteria were not growing as they should, because a mold had gotten in by accident. Other scientists had been within reach of the principle of antibiotic medicine, and even primitive people seemed to have used antibiotics without understanding them. Dr. Alexander Fleming was later knighted and won the Nobel Prize in medicine for his discovery.

Fleming, then an obscure researcher in a London hospital, stared with wild surmise at the now famous culture dish in which bacteria were not growing the way they should because a mold had gotten in by accident. It is true that the discovery of penicillin ushered in the Antibiotic Era. But antibiotics of one kind or another had actually been used in the treatment of disease—albeit unwittingly—from time immemorial.

The Chinese, for example, discovered about 2500 years ago that mold-infested soybean curd could cure skin infections. Agaric acid, produced by a mushroom known as Polyporus, was long ago used in the treatment of night sweats caused by phthisis. And Central American natives used the spores and skin of certain mushrooms known as earth-stars to heal infected wounds. Those who emphasize the “backwardness” of primitive tribes might well recall how long it took our Western Civilization, with all its refined scientific techniques, to

draw similar conclusions about the activities of molds.

Actually, antibiotics as we know them today were on the verge of being discovered in the latter part of the nineteenth century. Louis Pasteur knew that the growth of anthrax bacteria could be impeded by other microorganisms. He even suggested that infections might be controlled through the use of microbial antagonists. This should have been the clarion call to scientists to open up antibiotic warfare against deadly germs, but nothing came of it.

Another man came astonishingly close to achieving Sir Alexander Fleming's discovery but missed by an inch. J. Tyndall, a British scientist, is now chiefly known for his charming and astute popularizations of science. In 1881, he actually described how solutions that were cloudy with bacteria growing in them cleared up when certain *Penicillium* species grew on the surface. Tyndall, apparently, was too busy with what he regarded as

more important matters to pursue this momentous observation.

During the same period, medical authorities could have been led to the discovery of antibiotics through another problem that was worrying them. Their great fear was that the soil was becoming a vast reservoir of pathogenic microorganisms resulting from the accumulation of dead bodies and the excreta of humans and animals suffering from infectious diseases. The truth was there to see, for scientists actually introduced certain disease-producing bacteria into normal soil and found that they did not flourish or even survive. What seemed even stranger, such harmful germs survived in greater numbers when placed in soil that had previously been sterilized — in other words, when there were no other organisms to hinder them. But the clue was never followed up.

It was not until ten years after Fleming's discovery that a group of investigators at Oxford University actually isolated a crude form of

How the humble molds leapt into first place in medical research
and promise undreamed-of success in the war against disease

hemical Warfare

By JOSEPH BERNSTEIN

➤ WHEN DR. SELMAN WAKSMAN and his associates at Rutgers University isolated streptomycin from a mold growing in the soil, a great rush for antibiotics from the soil began. Explorers from the American Museum of Natural History have participated in the gathering of thousands of samples of earth from the far corners of the globe. Some of our best antibiotics, like Aureomycin, Chloromycetin, and Terramycin, have come from the soil



Chas. Pfizer & Co., Inc., photo

penicillin from a *Penicillium* mold. World War II pushed the production of this first of the miracle drugs to top-priority status. Originally it could be produced only in small amounts on the surface of solutions in flasks, and it was worth more than its weight in gold. Later a new strain of *Penicillium* was isolated from a moldy cantaloupe picked up in a grocery store in Peoria, Illinois, by a laboratory girl working for the Government. This new strain—discovered after 50,000 other strains had been tested—increased production spectacularly.

But it was still not enough to meet the urgent clamor for penicillin throughout the world. What was needed was an entirely new way that would permit quantity production. The Government experts working on the problem scanned the horizon for a commercial organization that could undertake such a vast program. For many years, the Chas. Pfizer company, in Brooklyn, had been the world's greatest producer of citric acid by means of large-scale fermentations caused by microorganisms. When this company put its engineers and chemists to work on the penicillin problem, they came up with a revolutionary discovery. What they developed was a method of growing the molds producing penicillin in

enormous tanks *below the surface* of the solution, rather than on top. From then on, the precious substance was produced by the ton.

Ten years after Dr. Fleming's observation, it was discovered that the soil might be the best place to hunt for potent antibiotics. In 1939, Dr. Rene Dubos, at the Rockefeller Institute for Medical Research, isolated tyrothricin from soil bacteria. But a truly triumphant find was made in 1944 by Dr. Dubos' own teacher, Dr. Selman Waksman, and his associates at Rutgers University. This was the isolation of streptomycin, now widely used in conjunction with other drugs in the

treatment of tuberculosis. It was isolated from a species of *Streptomyces*, an actinomycete growing in the soil.

Compared with the enormous difficulty of discovering a new antibiotic of the value of streptomycin, the finding of gold (or uranium) is practically child's play. Before streptomycin was found, Dr. Waksman and his colleagues studied 10,000 cultures of different organisms. Of these, 1000 had antibacterial properties, but only 100 of them could produce substances in the medium in which they grew that could prevent the growth of various microorganisms. Ten of the most

Chas. Pfizer & Co., Inc., photo



National News and Illustration Service, Inc., photo



▲ AS FIRST STEP IN SCREENING, each of the thousands of soil samples brought in is diluted with sterile water

◀ THE AUTHOR of this article was allowed to examine the dishes containing colonies of microorganisms produced from the sample of soil he brought from the Lake George area, New York. The scene is the Mycology Laboratory at the Pfizer plant



Chas. Pfizer & Co., Inc., photos



▲ COLONIES of soil microorganisms, actinomycetes, fungi, and bacteria, growing on agar

➤ A PURE CULTURE of actinomycete, which has been isolated from a mixed colony of microorganisms

promising of these substances were then isolated, and one of them was streptomycin. But the discovery touched off a grand antibiotics-from-the-soil rush in university, government, and pharmaceutical manufacturer's laboratories throughout the world.

Other antibiotics of great clinical value obtained from the soil were Aureomycin, chloramphenicol, neomycin, polymixin, and Terramycin. What they have accomplished in saving human lives and alleviating suffering is beyond calculation. From a dollars-and-cents standpoint, they outrank in importance all the other drugs combined. It has been estimated that the wholesale value of the most important antibiotics produced in this country alone in 1952 reached the fabulous figure of \$225 million.

This "chemical warfare" between living organisms is of paramount interest to naturalists. Discovery of it has raised questions never before thought of. In what manner do the antibiotics strike down microorganisms? How do microorganisms avoid the toxic effects of their own antibiotics? How does an organism

develop resistance to the substance produced by another organism?

That higher organisms also produce antibiotics is now increasingly evident. There is a composite plant, known as *Encelia*, that grows in arid areas in Colorado and Southern California. Vegetation is very sparse in such spots, but within a certain radius of *Encelia* no other plant exists. It grows in stark isolation in the center of a barren area. Recently it was found that this plant manufactures a substance that prevents the growth of other plants. In this manner it eliminates the competition for the limited water and nourishment in the soil. A similar but more common example is found in the walnut tree, whose roots produce a substance known as juglone. This also inhibits the growth of other plants in the area.

Microorganisms in the soil are likewise engaged in an intense struggle to maintain themselves against their competitors. Each species is constantly in quest of water, food, and space to grow in. But there is not enough room and food for all. The ones that have

developed antibiotics are able to check their competitors. But their advantage in the struggle for existence is not unlimited. What actually happens, and this in many subtle combinations, is that some substances produced are used in the metabolism of other organisms. In other cases, two different types of antibiotic-producers in the same vicinity destroy themselves with the toxic agents released. No particular organism is so fortunate as to maintain a permanently invulnerable stronghold in a given environment. Sooner or later it must inevitably give way to a more powerful successor, which in its turn may also have to surrender its place. This is the well-known phenomenon of succession, and chemical warfare by microorganisms plays a major role in determining which forms are the winners and which the losers.

In our pride we may imagine that this life-saving brand of chemical warfare was a product of man's inventiveness. However, the principle of combat through the release of toxic agents was perfected by the lowliest organisms, long ago in the dim past. The use of antibiotics by

man is merely the adaptation of this type of environmental chemical struggle to the new arena of infected human or animal tissues. It is simply another refinement of man's facility in adapting the assets of other organisms to his own needs. Our use of the chemical defenses of a soil microbe against pathogens that afflict us is not really so different from using the fur of an animal to keep us warm.

Because most of the antibiotic research has emphasized soil organisms, the phenomenon of antibiotic production by higher plants has not been in the limelight. But an analysis of more than 3000 different flowering plants has shown that about one-fifth of them had antibiotic effects against bacteria. Yeasts, lichens, mushrooms, and algae also produce such substances.

The use of herbs and extracts of plants is one of the time-honored branches of medicine. Many plant products that were effective against infections probably had antibiotic properties. Garlic and onions, for example, were long held in esteem as therapeutic agents in primitive medicine. Recently Russian scientists announced that volatile substances from onions and garlic are very potent in treating infected wounds. Antibiotic substances have been isolated from cabbage juice, buttercups, burdock, mountain-ash leaves, wheat flour, cloves, ragweed, rhubarb, blueberries, and even honey (which is a plant product). These are only a few of many examples that could be named.

Red-pigmented onions produce antibiotics that make them resistant to the fungus disease known as "smudge," whereas unpigmented onions are readily attacked by it. Another fungus disease of economic importance is called root rot. It causes trouble in cotton crops, but plants belonging to the class known as monocotyledons, such as wheat, barley, onion, and grasses, never get the infection, because their roots produce an antibiotic that is lethal to root rot. Similarly, tomato plants produce an antibiotic called tomatin, which can ward off attacks

by the fungus that produces tomato wilt. Antibiotics are generated widely throughout nature and in almost infinite variety. Plants have developed them through the long process of evolution, just as they have achieved other adaptations that help them compete with other organisms.

The range of organisms against which a particular antibiotic is effective is called the *antibiotic spectrum* of the given substance—an expression basic to the language of all workers in the field of antibiotics. Penicillin, for example, has a narrow spectrum of action. It is potent against a relatively small number of organisms. In other words, it disrupts a life process that certain kinds of bacteria cannot bypass, whereas other bacteria can utilize alternative chemical paths when penicillin interferes. Such organisms are not destroyed by this antibiotic.

On the other hand, there are the broad-spectrum antibiotics, such as Terramycin and Aureomycin. These can attack a much wider array of organisms, from viruses and rickettsias to many different types of bacteria. The reason for their broadside effects against such a wide range of organisms is that the chemical reaction they interfere with is so fundamental to living matter of all kinds that relatively few organisms can substitute something else.

With the powerful antibiotics now available, the question may well be asked why new antibiotics are constantly being sought. Why cannot the old ones be used to wipe out once and for all the deadly germs that plague humanity?

This would not be reckoning with the subtleties of nature's ways. Microbes do not take the chemical onslaught lying down. For example, streptomycin has been known to lose its effectiveness, particularly when used against nontuberculous infections. Indeed, all species of bacteria can acquire resistance to streptomycin. And staphylococci germs have been found, especially in hospitals, that can resist peni-

illin. Disease germs fight back with what could be called insidious cleverness if microorganisms had mental processes. Actually, the resistance they gain results simply from the constant variations produced in all living organisms—whether they be lowly bacterial cells or lofty mammals such as man.

All organisms reproduce themselves according to a pattern of "family resemblance" but with the offspring showing variations from the parents. This is due to a reshuffling of the genes and also to the appearance of new genes through mutations. In the case of microorganisms, the life cycles are extremely short, and the chances of new varieties are very great. Among the vast numbers of new creations may appear one that can take even a powerful antibiotic in stride. Its genic mechanism in some way equips it to survive the type of chemical attack that has been developed against it.

Also some bacteria can produce enzymes that destroy the antibiotic. An example is the production of the enzyme penicillinase by some bacteria, which disrupts the penicillin molecule, rendering it ineffective. It is possible that a great deal of resistance to antibiotics by some microorganisms may be due to a similar type of enzyme counter-attack.

And what almost seems to add insult to injury is the fact that there are bacteria that actually thrive on certain antibiotics. This seemingly capricious state of affairs was first discovered with streptomycin.

Because indiscriminate and *inadequate* dosing with antibiotics can speed the development of resistant strains, cautions have been issued. Also, combinations of antibiotics are increasingly prescribed, so that microorganisms spared by one antibiotic will be picked off by another. This technique has found particular application in the treatment of tuberculosis.

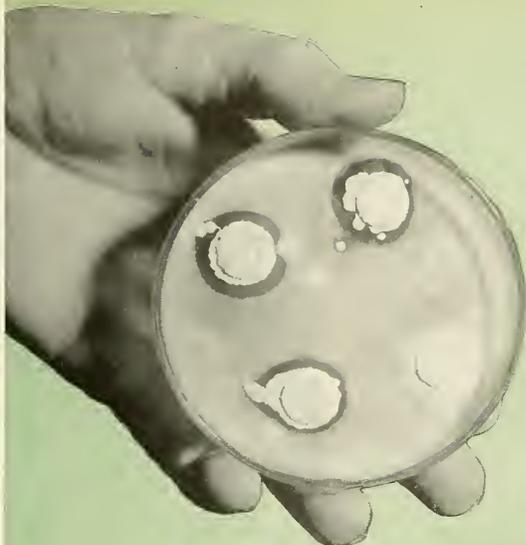
Penicillin is at present still as effective among the general population as when it was first introduced.

Complex, indeed, are the ways of microbes, and scientists are only beginning to fathom the deeper secrets. As remarked earlier, one of the riddles they would like to solve is why antibiotic-producers do not succumb to their own poisons. A partial answer to this question is seen in the fact that some do. There are extreme cases in which the life activities and growth of the antibiotic-producer are completely stopped by its own product. In such instances, unless the antibiotic is quickly removed from the vicinity of its own producer, the organism dies. What this apparently means from an evolutionary point of view is that the susceptible organism has only recently perfected a new antibiotic through mutation and has not yet had time to perfect resistance to it.

Where complete resistance exists, as in the mold named *Trichoderma viride*, it probably means that the antibiotic has been produced for a relatively long time. In other molds, such as *Penicillium janczewskii*, the organism is only slightly damaged by its own poison. Here the antibiotic, griseofulvin, causes the mycelial threads to develop in an abnormal manner.

Antibiotics have been isolated from a large variety of organisms, ranging from bacteria to the flowering plants. However, the fungi and their allies have so far been found to produce most of the antibiotics known. Even the fungi have but barely been tapped to discover what antibiotics they can produce.

Of the 100,000 species of fungi now known, only a minute fraction have been explored for this purpose, and even then the main attention has been given to the *Penicillia* and *Aspergilli*. The vast majority of the fungi known to produce antibiotics are typically soil-dwellers. But this does not mean that a spectacularly valuable antibiotic might not be found in another type of organism tomorrow. Such a new substance may have an entirely different chemical structure from any now known and a brand-new set of biological prop-



◀ TERRAMYCIN COLONIES, showing inhibition of growth in their neighborhood

▶ THE MOLD known as *Streptomyces rimosus*, from which Terramycin is produced

Chas. Pfizer & Co., Inc., photo



▼ IN THE SEARCH for new antibiotics and in the final testing for purity and potency of the finished products, thousands of petri dishes are filled with a nutrient media for the growth of bacteria

Chas. Pfizer & Co., Inc., photo





Photo from Agricultural Sciences Division, Medical and Pharmaceutical Information Bureau

➤ ANTIBIOTICS are also useful in treating animals. Here veterinarian G. E. Hawley is injecting Terramycin and serum to stop "shipping fever" in cattle, a treatment reported to be highly successful



known from experience what they could produce in the way of antibiotics. The other organisms would be grown under suitable conditions for the production of antibiotics, and tests would be made to see how effective they were against disease germs.

By this time my interest in the microorganisms I had brought back from Lake George had become quite intense. Would a new antibiotic, of great value to mankind, be produced from one of them?

When I next telephoned Dr. Routien, I tried to conceal my eagerness. Dr. Routien, on the other hand, sounded like someone trying to break the bad news as gently as possible.

Of all the actinomycetes, five showed antibiotic activity, four of them of the same type. But the activity shown was not impressive, so that none of the organisms would be tested further. The saga of the Lake George molds thus came swiftly to an end. But I had been vastly impressed by what was going on here and in other centers and was excited to think that someone might tomorrow or the next day send in a soil sample from his own backyard that could conquer polio, cancer, or tuberculosis. My brief encounter with the great antibiotic hunt that is now going on increased greatly my respect for the earth. For in the soil are locked many secrets that can expand man's horizons and improve his welfare. "Speak to the earth," says the Book of Job, "and she shall teach thee."

Scientists are speaking to the earth with subtle and precise techniques. What they are learning about the lowliest organisms that inhabit the soil has begun to transform our lives.

elaborate machinery of the Pfizer soil-screening process was turned on my soil sample. Laboratory assistants placed it in a liquid suspension, shook it up, and transferred parts of it to dishes containing four different types of food for the molds and bacteria to grow on. Different dilutions were used for each of the media to bring out as many kinds of organisms as possible. The microorganisms were then incubated in these dishes.

When I next returned to the laboratory, I was astonished to see what had been produced from my bit of soil. Spread out on a table before me were 69 Petri dishes, each crowded with a forest of colonies of various types of organisms. At this stage, many of the colonies had not yet developed the appearance that would later characterize them. Most of them were still fuzzy white masses, but some were beginning to assume the greenish tint of *Penicillia*. There were numerous clumps of bacteria, and several yellowish-white nodules, which Dr. Routien identified as actinomycetes.

He gave me a needle and suggested that I test the difference by picking at one of these colonies and also at a bacterial mass that resembled it superficially. The colony of bacteria was soft and readily penetrated and crushed by the

needle. The actinomycete nodule, on the other hand, was tough and resisted penetration.

While I glanced at several of the colonies under the microscope, a laboratory assistant made transfers with sterile needles from each visibly different type of colony to test tubes containing nutrient materials, so that each different type could grow in isolation. Eventually, 43 different tubes were so treated.

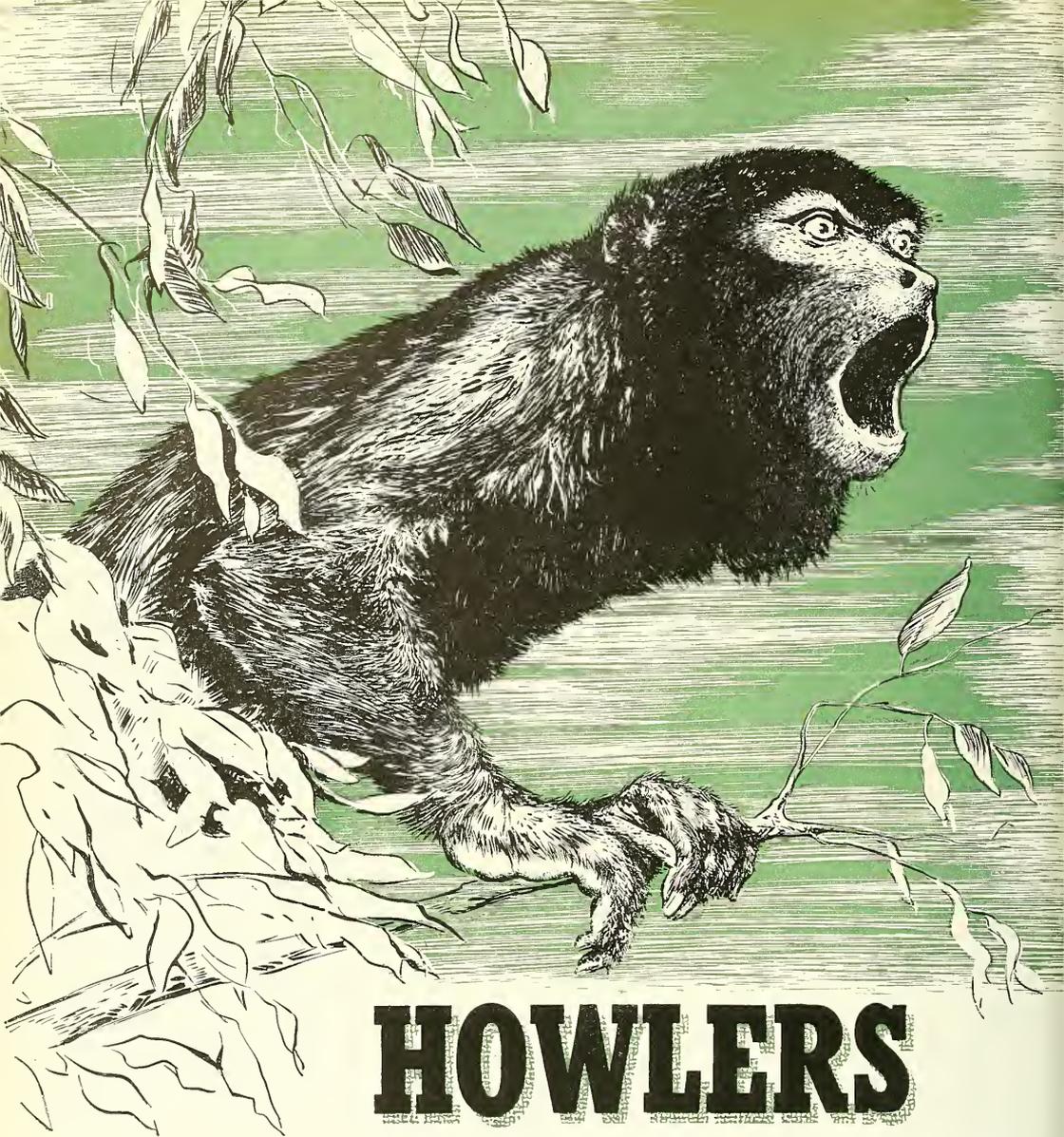
"We'll find out more exactly in two weeks the different kinds of organisms that were present in your sample," said Dr. Routien.

When I next spoke to Dr. Routien, he had more information about my microorganisms.

"We got about a dozen different fungi," he said. "There would have been more if we had used more types of media."

Among the organisms found were some *Penicillia*, two different *Mucorales*, an *Aspergillus*, a *Trichoderma*, several imperfect fungi that had not yet been identified, and nine different species of actinomycetes. Dr. Routien expressed surprise that there had been so many of the latter, derived from 23 colonies. Ordinarily, acidic soil from forests would have had few such organisms.

Most of my fungi would not be followed up because it was already



HOWLERS

Beginning like the rumble of distant thunder, the chorus produced by a band of these monkeys rises to a deafening roar, and you know you have heard the most spine-chilling sound of the American tropics

By WILLIAM E. LUNDY
Drawing by Torson Gide

IT was late afternoon and only the sound of the ever-present insects broke the sultry stillness of the banana plantation through which I was strolling. Even the huge leaves of the banana plants, so sensitive to the slightest breeze, did not stir.

A tayra, looking like a large black

weasel, started across the railroad tracks, caught my scent, and bolted out of sight.

Only three days before, I had arrived in Panama to work for the

United Fruit Company, and I was accompanying my brother on a trip to pay the laborers of the banana plantations. When the pay car jumped the track, I wandered on

through the tunnel formed by the leaves of the banana plants overlapping above.

Suddenly I stopped. From the tropical rain forest that bordered the plantation about a half mile to the north there came a dull roaring sound, not unlike distant thunder. At first it seemed but a single voice, then others joined to form a chorus. Louder and louder it grew, swelling in volume until, considering the distance from which it came, the noise was astonishing. Reaching its crest, it rapidly dropped to a low rumbling and died away.

Alone and without firearms, I decided to risk no encounter with wild animals capable of roaring in that fashion. I quickly retraced my steps to where my brother was watching a wrecking crew trying to coax the pay car back onto the narrow-gauge track.

"Percy," I asked, "What on earth made that roar from the jungles a few minutes ago?"

In our younger days Percy had often played pranks on me, and I thought I caught the old gleam in his eyes when he grinned and said, "Monkeys." Putting all the sarcasm that I could into my voice, I replied, "Sure! Monkeys! And tonight you will invite me to hold the bag on a snipe hunt!" Then I learned that wrecking crews, as well as monkeys, could roar.

My bride was more fortunate than I, for when she came to live in the tropics three years later, her first meeting with these particular monkeys—Howlers—was at exceptionally close range.

We had been following a trail along the Sixaola River when we emerged from the jungle and entered a large cacao (cocoa bean) plantation.

From some sprawling guabo trees, used as shade producers for the lower and slow-growing cacao trees, there came a low, jabbering sound, not unlike a group of mischievous children giggling over an exploit. Recognizing it as the "feeding talk" of the Howler Monkeys, I motioned to my wife to follow quietly and moved toward the sound.

A low, deep-throated "Uh, uh, uh, uh" soon told me that we had been seen and that an old male was warning the others of our approach. A few steps more and I saw a band of 30 or 35 Howlers that had come from the near-by jungle to feed on the ripe beanlike pods of the guabo trees, not more than 20 yards away! Here was the opportunity to introduce my bride to the Howlers in a way that she would never forget! Before she had seen the monkeys, I fired a revolver into the air.

The din that followed was deafening! The terrific roars of the old males, the higher pitched roars and screams of the less mature animals and the females, and the shrill shrieks of the very young, combined to make the most terrifying noise I have ever heard. Panicky youngsters climbed to the protection of the backs of the screaming mothers. The band, still roaring and screaming, began moving toward the jungle, the old males forming a rear guard.

The monkeys were not alone in their fright, however. With the first roar, my wife had sprung to my side and clung to me, shaking with fear. Only when she saw that I was amused did she begin to relax. Frankly, the bedlam was much greater than I had expected. Had I not known the source, I believe that I might have broken into headlong flight like Mr. Abel in Hudson's *Green Mansions*. Later I was ashamed of the terror I had caused among the monkeys and resolved never again to fire a shot so close to a band of Howlers.

So powerful is the voice of the Howlers that many of the naturalists and writers who have visited the American tropics since the time of the Conquests have left records of it. The famous naturalist, Alfred Wallace, wrote of "... the Howlers, whose tremendous roaring exceeds that of a lion or bull..." In recent years Dr. Frank Chapman described the howling: "Beginning as a low grunt, it grows louder, rapid, more incisive, and quickly rises to an overpowering, ferocious-sounding roar." Another time, he wrote that "There have been occasions

when . . . the uproar of a clan of Howlers . . . became almost unendurable."

From the foregoing, one might assume that these animals, the Black Howler Monkeys (*Alouatta palliata aequatorialis*) must be of considerable size. Yet the heaviest males seldom surpass 20 pounds in weight and are only four feet in length from the crown of the head to the tip of the tail, the tail being approximately one half of the total length.

The explanation of their extraordinary vocal power is, according to Mivart, "an enormous distension of the . . . hyoid bone into a large, deep, bony cup . . . Into this cup is received one of the . . . sacs with which the larynx is provided."

Perhaps Dr. Chapman had been awakened too early and too often by bands of Howlers when he described an old male by saying: "... my impression is that his face is the incarnation of every evil thought that has ever passed through the mind of man. Large, round, sooty black eyes, deep-set, far apart, and overhung by a low forehead, nose so flat that it is a little more than a site for the nostrils, mouth so enormous that when widely opened the head disappears behind gaping rows of teeth, a scraggly beard, the whole expression an inconceivable exaggeration of gloomy, bestial brutality." He admitted, however, that the females are much less repulsive than the males and that the young are singularly attractive. Unfortunately the only young Howlers I've been close enough to to study their features have been captives. In each case, a look of fear, even when they were being fondled by their captors, marred their tiny, hairless, black faces, which otherwise might well be classed as "cute."

Though the newly born Howlers are often yellowish in color, they eventually change to black, or black with rusty-brown sides.

Many guesses have been made as to why the Howlers howl. The first dim rays of dawn seem to act as a signal for the day's first outburst, though they are sometimes heard even earlier. A shower of rain, the

passing of an airplane overhead, the appearance of a man on the ground beneath them, or any sharp, unusual noise may set off a roar. These roars have been attributed to discomfort, bluff, indignation, or just the desire "to get it off their chests."

It is well known that *Monos Negros* (Black Monkeys) live within a fairly well-defined section of the jungles, and Dr. C. R. Carpenter, who spent eight months studying their behavior and social relations, came to the conclusion that the primary use of their howls is to announce to all comers that "this is our territory." He found that when two bands whose territories adjoined or overlapped came close to each other, a vocal duel began and continued until one of the bands withdrew deeper into its own territory. Always one band retreated before an encounter could take place.

Many times when visiting on Barro Colorado in Gatun Lake, I have been awakened at early dawn by howls from the "Laboratory Clan" and the "Fairchild Point Clan" on opposite sides of the laboratory clearing. Often this vocal duel would still be in progress at breakfast, when sleepy scientists, to whom the howling had ceased to be a novelty, would mutter that they wished those blankety blank monkeys would take their noise to the other side of the Island.

The daily routine of a Howler's life is more lazy than exciting: lusty roars at crack of dawn, more an hour later; breakfast, which sometimes lasts until after mid-morning, consisting of buds, leaves, and fruit if available; a "rest period," lasting through the heat of the day; dinner-supper from mid-afternoon to twilight, and then selection of comfort-

able crotches in which to settle for the night.

Slow and deliberate in their traveling, they often cover no more than a few hundred yards in a day. Sometimes, where food is plentiful, they will spend more than a day in or near a single tree.

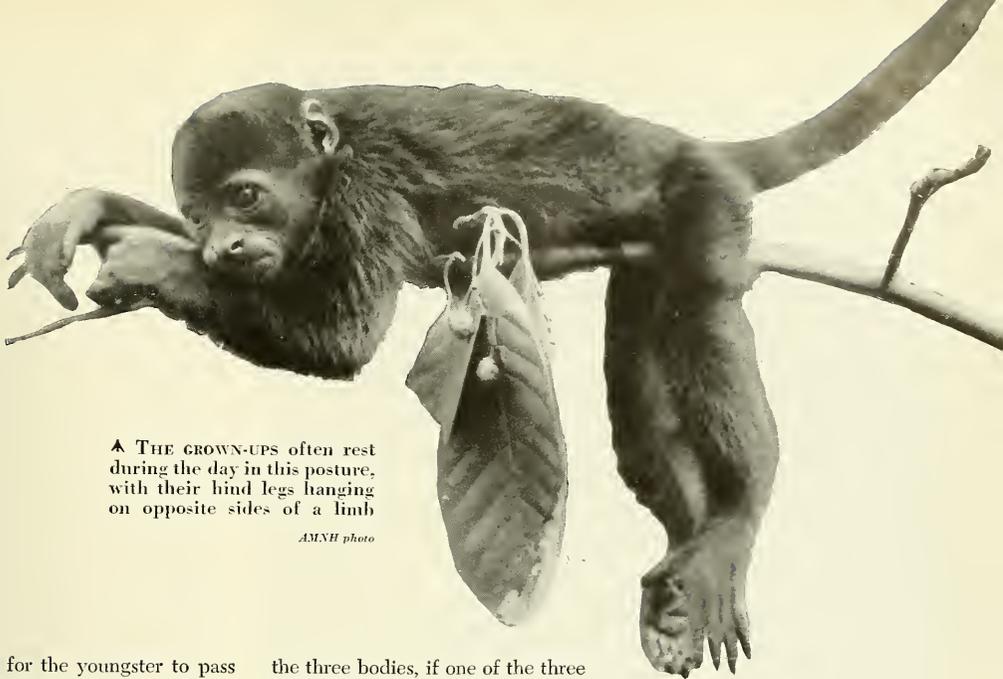
When on the move, Howlers travel routes used over and over between their feeding grounds and the trees in which they spend the night. They are not generally given to long leaps, as are the Capuchin (White Faced) Monkeys. Usually in passing from the limbs of one tree to those of another, they will secure a good hold across the gap with their hands before releasing the grip of their prehensile tails. Sometimes a mother will consider the passage too difficult for her half-grown child alone and will keep her hold on both boughs, letting her body be used as

▼ A YOUNG HOWLER MONKEY named "Ugly" has just arrived at the New York Zoological Park by plane from South America. Mrs. Cordier is showing him around

N. Y. Zoological Society Photos



▲ THE SAME HOWLER shown at left but somewhat older. Howlers are often yellowish when born



▲ THE CROWN-UPS often rest during the day in this posture, with their hind legs hanging on opposite sides of a limb

AMNH photo

a bridge for the youngster to pass over. On two occasions I was sure I heard a mother signal to her young to mount her back before she made a jump of several feet from one limb to boughs of another.

During rest periods, the adults often relax by lying on their bellies along a horizontal limb, their hind legs dangling on either side, while their chins rest on their hands, which are folded on top of the limb. At other times, they lie flat on their backs on a broad limb, their legs and arms stretched out to either side. Risky? No, for the tail holds securely to some branch or vine.

The resting mothers seem unconcerned about the safety of their youngsters romping and playing in the treetops, where it would seem that a slip would send them plummeting to the ground, often more than 100 feet below. I once watched three "teenagers" hanging by their tails in a treetop, so tangled together that from the ground I could not tell which arms and legs belonged to which monkey. Pushing, pulling, playfully biting each other and jabbering in glee, they swung about like a drunken pendulum. The mothers dozed near by, while I nervously watched, wondering if two tails would support the weight of

the three bodies, if one of the three tails should lose its grip!

Dr. Carpenter wrote that during the months in which he studied these interesting animals, he seldom saw or heard cross actions or "words" among members of a clan. There was no attempt to take food from another, no reaction on the part of a mother if another adult scolded or approached her young, and strange as it may seem, no fighting or even contesting between the males for possession of a female during her mating periods.

The males are apparently abominable "lovers," for the courting is usually done by the females. To the love-sick female, a male is a male. Approaching the nearest one, the lady "turns on her charm" by crouching in a submissive manner, opening her mouth and moving her tongue in and out, up and down. This is her offer of "trial marriage." With this "husband" she consorts for a day or two, but when he shows more interest in the fruit of the wild fig tree than he does in her affections, she seeks other company—and there is no protest from the deserted male. Before she, too, tires of courtship, she may have had three or more consorts. Only twice did Dr. Carpenter see a female show

preference for one particular male.

For the first two weeks of its life the baby Howler clings to the chest of its mother, possibly to be near the source of nourishment. Then it starts supplementing the milk diet with bits of leaves and buds, which it takes from the hands of the mother. Thereafter the baby will be seen traveling "piggy-back," its tail curled around the mother's body, until ever-lengthening exploratory trips, taken while the mother rests, teach the youngster to travel alone.

Howler Monkeys are seldom seen in captivity. True children of the jungle, they pine away and die within a few months after being taken from it, even though they are very young when captured.

A young Howler maiden, the "Claudia" of Dr. Chapman's *My Tropical Aircastle*, was found abandoned in the jungles at about two months of age and was given a home in a large cage on Barro Colorado, close to the edge of the jungle.

"Claudia might, with reservations, be your friend," wrote Dr. Chapman, "but she certainly was no one's pet." It required 54 days of coaxing, feeding choice morsels to her, and finally rescuing her from



N. Y. Zoological Society photo

▲ A MANTLED HOWLER MONKEY. Once when a baby fell in the tree, an adult male was seen to retrieve it

some ropes in which she had become tangled before Dr. Chapman was allowed the familiarity of stroking her head.

Whenever other Howlers were seen or heard from the clearing, even though they were at a considerable distance, Claudia moaned pitifully; and after only twelve months of captivity, she died. Concluding her biography, Dr. Chapman said, "Whatever the autopsy might show, I believe that Claudia died of a broken heart."

Howler Monkeys have a little surprise that they often spring on unsuspecting observers. Some scien-

tists are loath to give the monkeys credit for *planning* these "bombings" of anyone caught standing directly under them, saying that possibly the presence of humans excites the monkeys, causing a spontaneous release of the "bombs." Be that as it may, while with a young ornithologist, I once came upon a band of Howlers, the vanguard having already passed over the trail. As we stood watching, two of these turned back, almost reversing their line of travel, and selected a limb that reached directly over the spot where Tom was standing. As they began moving slowly toward him, I called,

"Tom, two of the monkeys are almost directly over you." "Yes," he replied, "I'm watching them." A moment later, he came running toward me, brushing his clothes as he ran! With a sheepish look, he said, "I thought that you were referring to those two coming from the other side of the trail!"

This trick has not been learned by the Howlers in recent years, for Dampier in his *Voyages* wrote of them: "Some broke down dry sticks and threw them at me; others scattered Urine and Dung about my ears."

Dr. Carpenter had similar experiences during his studies on Barro Colorado in 1934, for he wrote, "Either seen or unseen, an individual would slowly approach to a place directly above me... and then would release excrement..."

Exaggerated stories of co-operation among Howlers are often heard. The tales seldom come firsthand, but the teller usually knew someone who claimed to have seen a band of Howlers or Spider Monkeys cross a stream by forming a chain of their bodies, the ones behind holding to the tails of the ones in front. No such action has been reported by scientists, but two native bushmen-hunters, whose observations were known to be dependable—reported to Dr. Carpenter that they had personally seen adult Howlers swim the upper Chagres River "*mismo un hombre* [same as a man]," and demonstrated with overhand strokes. An adult female Howler escaped from Dr. Carpenter by swimming from a tiny islet to the shore of Barro Colorado.

Don Felix de Azara wrote just after 1800: "Some persons assert that they have seen them [Howlers] take leaves, chew them, and apply them to their wounds; but in those that I have... wounded, I have never observed anything of the kind." Variations of this story are still to be heard whenever a group of uninformed persons discuss the ways of the Howlers.

Some tell that, stationed one above the other, Howlers will pass a wounded monkey up from one to

the other until it reaches safety. Such has not been reliably recorded. Dr. Carpenter *did* see an adult male descend and retrieve a baby monkey that had fallen to within 25 feet of the ground, after its mother had been killed. Ordinarily, according to Dr. Carpenter, no help is given an individual, even though it is crippled and having difficulty in keeping up with the clan.

In 1914, when the rising waters of Gatun Lake changed a hilltop into Barro Colorado Island, it was estimated that no more than 70 Howlers inhabited the area. Nine years later the island was set aside as a wildlife preserve, and under this protection the Howlers increased rapidly. By 1934, they numbered 489, according to a "census" taken by Dr. Carpenter; and it is believed that the population increased until a peak was reached in 1949, though no count was made at that time.

What happened to the Howlers in 1949-1950 remains a mystery. It became noticeable that their numbers had decreased sharply, and in 1951 a careful census, taken by Dr. Nicholas Collias, indicated that only 239 remained on the Island! The "Laboratory Clan" had shrunk from 40 to 17 individuals. But even with these reduced numbers, Barro Colorado's six square miles of surface

contain more Howlers than any area of similar size in Central America.

Predators have been ruled out as the cause of the decrease, for very few observations of attacks on the Howlers have been recorded. Ocelots, harpy eagles, and boa constrictors may take an occasional victim, and bot flies, which attack the throats of these monkeys, are known to cause a number of deaths.

Many believe that Jungle Yellow Fever was the main factor. A wave of this fever, to which the Howler Monkeys are highly susceptible, is known to have swept across Panama at that time. Thanks to the development of preventive medicine, however, in areas where inoculation is the general practice, *Vómito Negro*, as the natives term it, is no longer the dread scourge to man that it was in the early 1900's.

Probably the greatest menace to the continued existence of the Howler Monkeys in unprotected areas is man. Ever pushing the frontiers of their jungle homes back and back, he reduces the area suitable for Howler habitation. Some natives use the Howlers for food, but more damage is caused by the "trigger-happy" hunters. There is one account of two hunters who, after a long day of fruitless search for game, came upon a band of Howl-

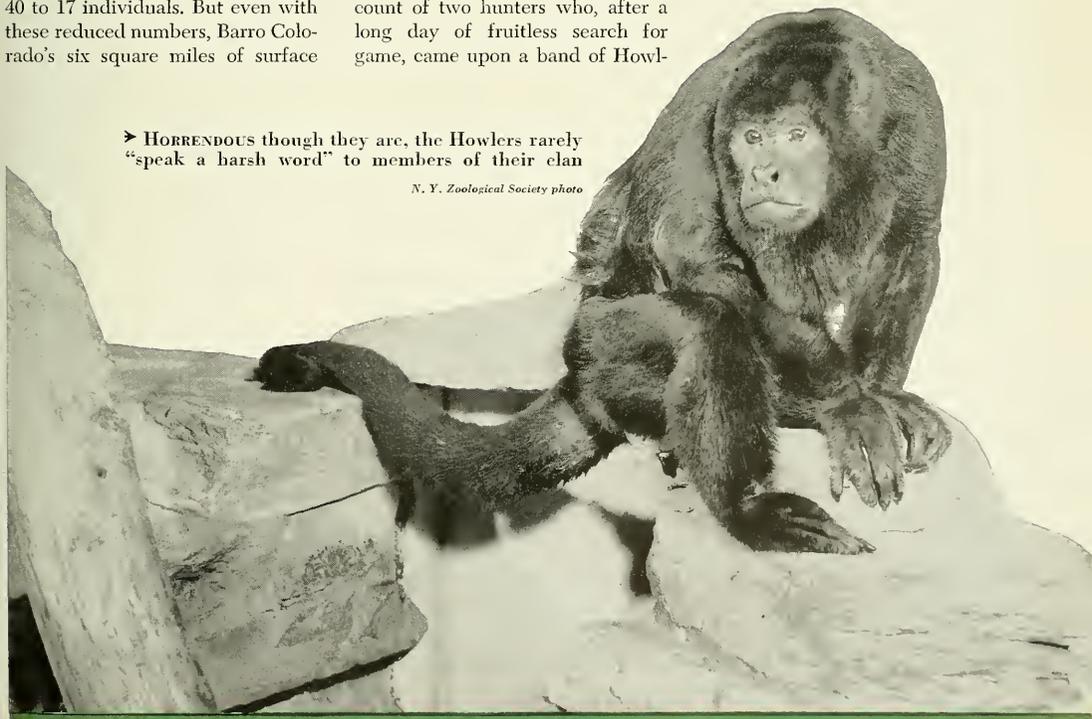
ers. The entire band of seventeen monkeys were slain to assuage their desire to kill.

I once came upon a Jamaican Negro hunter who was carrying a pair of dead Howlers and a living baby clinging to the breast of its slain mother. He had not killed them for food, but "To show them to the people." When asked what he would do with the baby, he shrugged. I left, feeling that I had looked upon first-degree murder.

Much of the above has been written in the library building on Barro Colorado, where one may expect at any moment to hear Nature's Animated Amplifiers roaring and howling from distances varying from a few yards to over a mile. With each outburst, I would pause to listen, still fascinated by the sound that made such an impression on my mind in my youth. And when there is an unusually fine chorus, I recall the words of my friend, the late Fred McKim, the author of *San Blas* and *The Forbidden Land*, who said, "Anyone who has not heard a band of Howlers howl at close range still has something to live for."

► HORRENDOUS though they are, the Howlers rarely "speak a harsh word" to members of their clan

N. Y. Zoological Society photo



WE were sitting in the lush green grass at the edge of Mule Deer Meadow, admiring the beauty of a little clump of wild flowers a few feet away. Suddenly, without apparent cause, one of the tall plants began to tremble, and before our astonished eyes it miraculously became at least three inches shorter. Before we had time to doubt what we had seen, the same plant began to quiver and once more sank rapidly into the earth. This phenomenon occurred again, and finally the entire plant disappeared beneath the surface. The earth had simply swallowed it up — stem, leaves, flowers, and all!

The little hole through which the plant had vanished was scarcely larger than the diameter of a lead pencil, but it led almost immediately into a large cavity that had obviously been dug by some ani-

The Little Plowman

In digging its burrows, the mountain pocket gopher starts a conservational chain reaction that reaches all the way to man

By LLOYD G. INGLES*

Professor of Zoology, Fresno State College

mal. This was my very first contact with a mountain pocket gopher or, as it was later named by a zoology student, the little plowman of mountain meadows.

The five years that followed were

to teach me much about this little creature, not only as an important link in the wildlife food chain of the mountains but also as a conservator of water and a maker of soil, both of which are of vital interest

▼ THE MOUNTAIN POCKET GOPHER is well equipped for its underground life. Note the strong front claws for burrowing. Its fur-lined cheek pouches on either side are used for transporting food





▲ "GOPHER CORES" are a common sight in the high country in early summer and cause much speculation among the uninitiated. The gophers dig burrows under the snow in winter and then, as warm weather approaches, plug them with the earth removed in the digging of underground burrows

to man himself. I saw it working in the dusk of August nights as the long-eared bats hunted for insects over the meadow. In the quiet of moonlight nights in February, I have heard it digging under the snow while coyotes watched for one to appear on the surface. Hundreds of similar observations gave me a familiarity with its kind and its interesting ways of life.

Nearly everyone living in the West has seen the little mounds of fresh earth on a beautiful green lawn and knows that they are the work of "gophers," as they are gen-

erally called. A few people who get into the high mountains early in the summer, after most of the snow has melted, have seen the long earthen cores lying on the mountain meadows, although very few connect them with the gopher activity of the previous winter. But rarely indeed, does anyone see the animal itself as it pushes the fresh earth out of its burrow or as it ventures a few inches out on the surface to snatch some particular plant before it darts swiftly back again into its burrow. The Mountain Pocket Gopher is a common rodent

of the California Sierra, but it is rarely observed because of its tunnel-digging habits.

Like most other creatures that live in the ground, it has a large repertoire of inherited behavior patterns and anatomical modifications that fit it to live where it does. The little rodent gets its name from the two deep, fur-lined cheek pockets on each side of the mouth, in which it carries its food from the place where it is harvested to the place where it is stored or cached. It can dig through the hardest earth, not only with the long, sharp front claws but with its strong front incisor teeth as well. Interesting too are the lips, which can be closed *behind* these gnawing teeth to prevent dirt from getting into the mouth. Although the long incisor teeth are worn away rapidly, Dr. Walter Howard and his associates at the University of California found they maintain their normal length by growing about 20 inches each year!

The pocket gopher has adapted itself to life underground in one way that is most extraordinary. A scientist made this discovery a few years ago while studying the physiology and anatomy of pocket gophers. At birth, young mammals must pass through a large circular opening formed by the fusion of the lower vertebrae, the pubic, and the hipbones. In tunnel-dwelling mammals, however, the evolutionary fashion has been toward smaller and smaller bones in the pelvic region. This enables the animal to turn more easily and quickly in its burrow. At the same time, however, it has made the "birth hole" smaller and smaller. In virgin pocket gophers it was noticed the pubic bones were always fused as they are in other mammals, but the resulting opening through which the young must subsequently be born was too small to allow their passage. However, examination of females that had given birth to young re-

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Mexico and Central America studying and photographing animals. He expects soon to spend three more months south of the border making strobelite photo-

graphs of some of the smaller mammals. Dr. Ingles is the author of *Mammals of California* and *Mammals of California and Its Coastal Waters*.—ED.



vealed that the narrow opening had been greatly enlarged to permit normal birth. It seems that during the first pregnancy a hormone in the blood simply dissolves away much, or most, of the pubic bones. The young pocket gophers can thus be born without difficulty, and their mother can still have small hips!

Many interesting adaptive features have been reported concerning the behavior of these animals. Even half-grown pocket gophers will instinctively plug and close an open burrow with armloads of earth. This not only deters dangerous enemies such as gopher snakes and weasels from entering the burrow but also maintains more equitable temperature and humidity within the den.

It was not until I devised a trap for taking the animals alive, however, that I was able to learn much about the more subtle and important features of their lives. By a system of claw-clipping it was possible to individualize each animal. Then,



▲ THE MOUNTAIN POCKET GOPHER is rarely seen outside its burrows except when it comes up to push out fresh earth

▼ SOMETIMES ALBINOS or near-albinos such as this occur in the pocket gopher community



▲ THE NESTS of the mountain pocket gopher are usually made of fine grass and are located about one and one-half feet below the surface. However, they are not infrequently built in the snow during winter

by releasing them and later re-trapping the marked animals, it was possible to follow their movements over a period of five years on three mountain meadows. In this manner, for example, it was learned that the life expectancy is a little over two years, but some individuals do reach the ripe old pocket-gopher age of four years. It was learned also that the individual burrow systems do not join each other. Each is usually occupied for its lifetime by a solitary pocket gopher, except during the breeding season.

When the deep snows fall and cover the meadows for half of the year, the pocket gopher does not have to hibernate below the frost line as do many other creatures living around the meadow. Instead, it merely comes up into the snow and establishes another burrow system roughly over the subterranean one. Most of these winter burrows are made between the snow and the surface of the ground, where the animals actually browse grasses and other small plants all winter. Not infrequently they may burrow a considerable distance up through the snow and may even cross small flowing streams or unfrozen ground that would be far too wet to pass over during the snowless months.

Ordinarily when the snow melts, the pocket gopher goes back into its earthen burrows and finds considerable spring house-cleaning to be done. Frequently much of the system is too wet, and often it is caved in. When the excess earth is removed, it is pushed up into the remaining snow burrows. When the snow melts, these earthen "cores" are left lying on the surface of the meadow like great snakes. They occasion much speculation among trout fishermen and others who get to see them before the rains and wind finally erode them away. I measured one such "core" that was 39 feet long, not including its side branches.

Occasionally, when the snow melts, a wandering individual finds itself stranded on ground far too wet or too rocky for a suitable bur-

row. It then has no alternative but to risk its life by moving above ground in search of a new location for a summer home. It is during this period that the animal is most vulnerable to its enemies, which consist of hungry wildcats, coyotes, and horned owls. Except for these unfortunate homeless individuals, however, there is reason to believe that the mountain pocket gopher fares better in winter than it does in other seasons. This is indicated by the fact that they reach their greatest size when they re-enter their earthen dens after a winter spent in the snow.

The nest of the mountain pocket gopher is about as large as a man's head and may be made either in the ground or in the snow. It is usually constructed of the dead inedible ends of grasses or the husks of bulbs and corms. A number of other small creatures use the nest, even when it is occupied by the pocket gopher. Once I collected eighteen kinds of small insects and arachnids from one nest, and when they were sent to the Smithsonian Institution for identification, most of them were found to be species new to science. Apparently the nest was a microhabitat that had been entirely overlooked by scientists.

A number of larger animals are also associated with the mountain pocket gopher and depend to some extent on its burrow for their own homes. In the middle part of the Sierra Nevada, above the 9000-foot level, one frequently finds wet meadows in late spring full of croaking Yosemite toads (*Bufo canoris*). Sometimes these little toads actually mate in great numbers in the shadow of melting snowbanks. When the hot, dry summer days come, however, they seem to disappear entirely, unless a person knows where to look for them. At this time almost every open, unused gopher burrow will be occupied by one or more of these little amphibians, which may be seen tumbling back into the opening if one approaches suddenly. Whether these interesting little sexually dimorphic toads feed entirely on the

smaller animals that inhabit the old gopher burrow, or whether they come out each night to forage in the vicinity of their daytime abode, is not known.

Another animal that lives in the mountain meadow community and is dependent on the activity of the pocket gopher is the montane meadow mouse (*Microtus montanus*), which runs through its burrows and uses its old, abandoned nests. These fat little mice cut neat trails through the grass and sedges over ground that remains too moist for the burrowing of the pocket gopher. Thus, in summer at least, there is practically no competition between the mice and the gophers for food because one gleans its livelihood from the surface of the soggy, wet portions and the other from beneath the surface on the drier parts.

Around Mule Deer Meadow there were about two acres of burrowable soil, on which were 25 potential or actual burrow systems of pocket gophers. They were never all occupied at the same time, although as many as 20 were used on two occasions. During the five years the little rodents were studied, there were from five to ten animals per acre in the spring and autumn respectively. The decrease in the population during winter seems to be largely from the ranks of the young, which leave the maternal burrow to seek homes of their own. The two to four young in the litter leave the burrow when they are about half grown. After they are weaned, they may actually be expelled by the mother. These young gophers are about the only ones to be seen making long land journeys on the surface in daytime. If they succeed in escaping their enemies and in finding an old unused burrow, they will grow very rapidly to adult size before winter. If, however, they must dig a new burrow, they frequently settle down on an area too small or too rocky to supply adequate food and will be dug out by some badger or coyote, or picked up by a horned owl as they venture too far out of their burrow

to obtain food on the surface. Occasionally, a young one will succeed in attaining adulthood even under such adverse conditions. One half-grown animal actually settled on two unsuitable areas before it found a place large enough to dig a new burrow and grow to maturity.

By its continuous digging the mountain pocket gopher benefits the meadow and the other creatures that live there. During the early summer, water from the melting snow runs into the vacated burrows and sinks into the ground instead of running off to swell the

rivers into floods farther down the mountains. On one occasion a geologist friend called my attention to a little stream running from a melting snowbank into a vacated burrow, doubtless one of millions throughout the length and breadth of the Sierra Nevada range. It continued to sink into the hole for sixteen days without filling it. This water was conserved to help the springs to flow continuously throughout the dry autumn season. Trout were able to live in the permanent stream, and more water was added to the lake for electric

power and for irrigation of crops in the valleys far away.

On various occasions I have weighed the soil brought to the surface by individual pocket gophers in the summer. The average amount is about 100 pounds a week. When there are ten animals on each acre, as in early autumn, this means about two tons of fresh mineral earth brought to the surface to be mixed with dead vegetation and transformed into humus. This adds to the fertility of the meadow, which means more grazing for more cattle, deer, meadow



▲ "HIS MAJESTY O'KEEFE" is filmed on the island of Yap, and Fijian actors form a large part of the cast. O'Keefe with his bride-to-be



◀ ONE of the many scenes in which O'Keefe shows what a he-man he is

▲ A GREAT TRIBAL ceremony is held when the Fijians switch from a native chief to Burt Lancaster, who plays "His Majesty O'Keefe."

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

mice, and grasshoppers. These, in turn, form food for other animals, including man himself. Thus, the mountain pocket gopher rightfully earns the name of "Little Plowman of Mountain Meadows."

In other parts of the world, Charles Darwin and later scientists have shown that earthworms play an important part in increasing the porosity and fertility of the soil. I am convinced that in the West the mountain pocket gopher is a much more important animal in this regard and is a conserver of water as well. What would the meadows be like if the Little Plowmen were not

there? We can only speculate. Would the grass still grow around the meadows over their burrows, or would sedges and mosses take over those areas? Could as many cattle and deer then graze on the meadow? Would there be as many grasshoppers? If not, what would happen to the Clark's nutcrackers that come to eat those insects by the thousands each fall? Where would the Yosemite toads go to escape drying up, if there were no old pocket gopher burrows? What would the montane meadow mice do without the old gopher nests in which to seek refuge from coyotes,

wildcats, and the horned owls?

Although these questions cannot now be fully answered, there can be no doubt of the value of the Little Plowman as a conserver of water and a soil-maker. He is an important link in the food chain in the meadows and he subtly affects the lives of many kinds of plants and other creatures.

Let us not be too concerned, then, if we should see a beautiful flower go into the earth by short quick jerks. It is merely becoming the food of a mountain pocket gopher, and hundreds of other lives may profit indirectly by its going.

"His Majesty O'Keefe"

Reviewed by ALPHONSE RIESENFELD

THIS is the story of Captain David O'Keefe (Burt Lancaster) in the early days of German colonization of Micronesia. In a mutiny he loses his ship, and his small boat is shipwrecked on Yap. There he turns into a shrewd trader possessed of but one idea—to strike it rich by exploiting the unused copra riches of

the island. This leads to clashes with the natives, who are not interested in gathering coconuts, with the German trading firm that periodically visits the island, and with a pirate from his former ship. With typical he-man heroism Captain O'Keefe overcomes all these difficulties and is even made a king by the natives. And, of course, there is the inevitable love story with a trader's daughter.

To demand authenticity from this film

is almost unfair to its basic conception, but it is interesting to note that the native Yap islanders are played by Fijian natives. There are not only physical but cultural differences between these two groups. Thus we are shown Fijian houses, dances, and canoes, together with the typical stone money of Yap, and in the quarry where these Fijians break the stone for the Yap money we catch a glimpse of a typical Easter Island stone statue placed there without any apparent reason. But in spite of such blatant discrepancies, the Fijian natives are delightful to watch, and their dances are very beautiful and remarkably authentic. The plaster copies of Yap stone money are impressive, and there are a number of well-observed details of Fijian village life.

Very beautiful and picturesque is the old Chinese barque that the Captain without a ship acquires in Hongkong from a dentist, who has great confidence in O'Keefe's ability. The crowded streets of that city make for a nice contrast with the quiet beauty of the Pacific islands; and the Chinese wedding of the Captain with the trader's daughter in Hongkong is quite spectacular.

There is plenty of action in this film because of the frequent, probably too frequent fights, in which the Fijian natives turn out to be first-class performers. The music, incidentally, is good, and it luckily avoids false orientalisms. In spite of occasional exaggerations, the film is good entertainment. It is a Warner Brothers production.

Brief comments on films previously reviewed

Documentary and Grade A

What the Experts Said

Annapurna
The ascent of the now-famous mountain

Beautiful and deeply moving film

Conquest of Everest
One of the greatest achievements in the history of exploration magnificently filmed

Stirring epic from on-the-spot material

The Living Desert
Disney's first feature-length True-life Adventure film, showing animal and plant life in the Great American Desert

Marvels disclosed in this film must be seen before one can sense full significance

Song of the Land
Series of excellent movies of various forms of wildlife

Framework on which picture is built will mean different things to different people

Tanga Tika
A story attempting to portray present-day Polynesian life

Takes an anthropologist to understand fully what the film is trying to do. Beautiful photography

Down the Alphabet

Beneath the 12-Mile Reef
Story of the fast-passing sponge industry in Florida Keys, filmed on location

Some noteworthy scenes of marine life woven into a story about the people who live in the Keys

taken to them on trips as far back as 1910. But those passages no longer exist. That arm of the glacier is nothing but scattered patches of *névé*. That's a granular stage between true snow and hard ice. The caves you see now are along the channel of Stevens Creek, in a section of the glacier called The Stevens. That's how much change there's been just recently."

"How can you tell what the caves will be like from year to year?" I pressed.

"Can't," Aubrey replied. "All we can do is to make comparisons with how they've been in the past. It's some time since they were as big as they are now. The tunnel with blue ice runs back under Stevens Glacier nearly 800 feet this season. It's dark after the first 80 feet; fairly uniform, with several side

chambers funneling off. Probably more than 1000 feet of tunnel there, totaling all the galleries."

"Does it open up into any large rooms?" I asked.

"Just one," he answered. "At the very end, there's a round room where the glacier lies against a rock cliff. It's thin ice back there. While we were taking measurements, a boulder the size of an easy chair loosened from the cliff above and crashed through the roof. The other tunnel is the big one, though. Stevens Creek flows pretty well from wall to wall, so we didn't go back more than 200 feet. But we walked on top of the glacier to its head, and all the way we heard the creek rumbling below us. That passage must be three-quarters of a mile long—three times the length of the tunnel with blue ice."

The caverns are dangerous, especially late in the season. By October, floors are littered with huge fallen blocks and ceilings are weak. Just a month after Louie and I visited the caves, the lovely blue tunnel collapsed.

Enormous slabs weighing many tons can come loose from walls and ceilings with the touch of a staff or vibrations from shouting or laughing. A tragedy occurred in July, 1915, when one member of a guided party entered the caves. Against all advice, he picked at the ice with his alpenstock. A tremendous chunk fell on him, instantly crushing him to death.

Signs along the trail now warn visitors that they go to the Ice Caves at their own risk. The rushing river, the cracking ceilings, and the melting walls are perilous.

But they are also beautiful. We're glad we went under the Paradise Glacier.

IN QUEST OF BIRDS OF PARADISE *continued from page 111*

pectors, missionaries, and carpet-baggers—and the local kanakas sought to stop the influx in a far from novel way, by shooting and spearing. The interlopers trudged in over the "Bundi" Trail, crossing the Bismarcks through a notch 9400 feet above sea level, to reach and taint the agrarian realm of 75,000 to 100,000 men who had lived through the ages in oblivion from the outside world.

Because of the many "murders," Australian authorities had to discontinue explorations here. White men were forbidden to enter the Central Highlands. This was the situation until World War II, when highland landing spots were sorely needed as emergency fields for planes fog-bound on the coast.

There followed a period when stealthy murder was the vogue. In the most insidious attacks, the murderer would steal up behind his victim, rap him on the head, and while he was unconscious, drive a bamboo splinter into his rectum. When the victim regained consciousness, he would rise, walk to his house,

and, a week or so later, die quite unexpectedly of peritonitis. This, I was told, had stopped. Nevertheless I was tempted to look behind me as I sat there in the forest. The magic marker on the ground looked bigger by the minute.

With sadness, one notes the encroachment of civilization in these parts. Natives look so splendid and handsome in their wild nudity, their regalia of shells and Paradise plumes, and so ignominiously decrepit and dirty in ill-fitting, cast-off clothes, which are seized upon invariably with the advent of "civilization."

But, thinking of the cannibalism discovered some months before, down-valley 50 miles from the cursed tree, I felt there was something to be said for "civilization."

And then, as if by design, a shaft of sun broke over the rugged crest of the Bismarcks and penetrated into the branches overhead.

There was a shuffle behind me. Maima had come. We hugged and grinned in genuine pleasure, his sheen of pig grease rubbing off

on my arms. Dropping to his knees, he examined the *tambu* shield, the stick symbol, then turned to the crowd that had appeared like mist, his Cantor eyes wide and wilder than ever. An order was barked. Four men ran off, soon to return with a stoic culprit, who looked as if he might relish murder, then or later. Yes, it was his *tambu*, his *gerua*. No, he would not rescind it—not until I moved from his burial plot.

Sunken cavities were all about in this island of forest. I was in a graveyard, virtually sitting on the remains of his father. The patriarch, I found, had died a couple of years before and, in accordance with native custom, had been tied in a sitting posture and inserted head up in a five-foot hole, there to sit uncovered, except by leaves, for a couple of months. The hole had been filled so it resembled a shallow basin, which served to mark the spot, along with the painted *gerua*.

Suffice it to say, I made amends as best I could and, in the end, only

had to move a few feet to one side. I cleared the area of kanakas and nervously waited. Sunlight! How rare a commodity it is in the cloud forest of New Guinea. For seemingly endless days we had prayed that sun, cameras, men, and birds would one day meet. Soon a *grrr*—a low growling note I knew to be the male Greater Bird of Paradise—came from the distance. This was followed by a series of *caow, caow, caows*, highly pitched and falling at the end of each syllable. This was also the male; but now seven or eight crow-like *caw, caw, caws* announced the arrival of females.

Not until I heard a sharp, high-pitched *kia* followed by a series of long-drawn, querulous notes, *gaaa, gaaa, gaaa*, did I know that a "drone" of Greater Birds of Paradise were moving toward the dance arena. This note is stimulating to the entourage of young birds of both sexes that are usually to be found in the vicinity of a fully adorned male when he is on or near a display tree. It causes them to fly about excitedly and prepare themselves for a ceremony.

It was thus with great excitement that I double checked the cameras, then settled down to make the following unique record with a watch in one hand and a tape recorder microphone in the other. Our equipment was, to say the least, quite different from that of the last person to record this ceremony, Dr. Alfred Russel Wallace, in the Aru Islands exactly 100 years before.

Our locality was Katumbag, at 5600 feet. It was 6:32 on the morning of June 28, 1952. Things were not exciting until 8:03 A.M., when the scene took fire. Soon a highly adorned male with plumes thrown upward like shimmering reddish-gold fans leaped from a hiding place in the crown 90 feet up, to the center of the dance arena. With sunlight sparkling, we worked feverishly to photograph the unforgettable scene on 16 mm. moving picture color films and on 20 or 35 mm. Kodachrome stills, and to

record on sound tape some of the remarkable vocal behavior of the Greater Bird of Paradise.

Sprayed out over the back of the bird, the delicate plumes completely hid the head. About ten females and young males, all highly excited and cawing strongly, darted about the immediate vicinity of the owner of the dance arena—a horizontal branch of pencil thickness approximately 6 feet in length and 70 feet up in an island of forest. This splendid creature seemed to be endeavoring to defend the central four feet of the branch from all comers.

A drone of activity seethed on all sides as females (and probably young males) landed on either end of the perch or on neighboring limbs. Each such advance seemed to infuriate the owner of the dance stage, and a postured mock attack would immediately take place, with the golden plumage in gorgeous disarray—almost a ball-like mass of plumes.

As soon as this male had driven off a transgressor, he would spin about and dash in the other direction to attack real or imaginary intruders. Much sharp ki-ing, cawing, and guttural growling rose in a crescendo, as though from the throats of maddened crows and jays.

Birds darted through the tempestuous scene from above or from below, sometimes to pause and be chased. The whole thing reminded me of a fox at bay before a pack of dogs. Earlier, I had seen an excited male hang upside down in one of its postures. This pattern of behavior had heretofore been known only for the Emperor of Germany and the Blue Bird of Paradise.

When the bird had assumed an inverted position, it hung with head pointed to the ground for a second or two, as though trying

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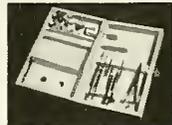


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to gauge its flight if it fell. At that moment a female dove down and landed on the same limb, directly above the suspended male, so that the feet of the two birds appeared to touch. This brought on an immediate fencing match, with the male pecking ferociously at the female from below.

Such antics often brought other plumed males into the vicinity to land near or on the display limb, only to be driven off with a superlative display of bravado. I saw as many as three adult males simultaneously in a single display tree, but, nevertheless, each dance arena or limb is the property of only one male. The dance revolves around him; when he is killed, the dance limb is deserted. I know of three instances in which males were

killed while on their display perches. In each, the dance ceremonies ceased completely at those trees for a period of at least several months.

Not knowing at first that one of these males had been killed, I spent a number of futile mornings awaiting its dance. The only pictures I succeeded in getting were made four days after the death of the adult. They were of a young male which, after hopping about quizzically for some time, finally got up nerve enough to sit on the dance limb, which, I noted, was shining from long use by the now dead owner.

This young bird, still in female plumage, then proceeded to elevate the wings characteristically and thump them at the wrists over

the back. It then postured with the wings stretched back-to-back above and well in front of the head. It performed this dance in absolute silence, except for the whirring of my 16 mm. motion picture camera.

It is likely that this or other young males would remain in the vicinity of this dance tree, and in time one of them would take it over as his personal nuptial chamber.

From our observations of the King of Saxony, the Superb, the Blue, the Magnificent, and, now, the Greater Bird of Paradise, we know that in these species, the dance arena is the property of a single male, and not a communal playground as previously believed by many naturalists, including Alfred Russel Wallace.

BOOKS

Continued from page 102

Even in historical times some of the early ideas about the origin of babies seem surprising today. The chick and the egg are the example used to explain the beginnings of life and the differences between male and female.

Mating takes place in the plant as well as in the animal world and while the fundamental and underlying principles remain in pretty much the same pattern, the great range of differentiation in organization calls for a great variety in the way sex is expressed and functions. In the higher animals we know that sex is normally fixed for a given individual, but with some of the lower animals the sex of an individual may vary with age. Some social insects control sex. The author uses frequent examples to develop his thesis; these are well selected, often illustrated

by his own sketches, and before long the reader senses that sex in one way or another conditions a very great deal of what is going on in the living world.

There is a helpful list of references at the close of the book.

HAROLD E. ANTHONY

THE TRACK OF MAN

----- by Henry Field

Doubleday, \$5.95, 448 pp., 28 illus.

THIS is the autobiography of Henry Field, who as a boy decided to become an anthropologist when he discovered Saxon relics on his stepfather's estate in England.

He tells of his many trips to the Near East and North Africa, where he collected archaeological material and took measurements of the natives, many of

whom were suspicious of him. He visited Kish in ancient Mesopotamia, where man lived continuously for six millenniums; Babylon, where Nebuchadnezzar built his temples and palaces, the Ishtar Gate, and the "Hanging Gardens"; and Ur of the Chaldees from where Abraham came. The many reports of his travels through desert country, with its ever-present dangers of sandstorms and attacking Bedouins, read like an enchanted story from *Thousand and One Nights*.

As a Curator of Physical Anthropology at the Chicago Field Museum, he prepared two Halls, one on the Stone Age of the Old World and the other on the Races of Mankind. In order to get the material for these halls, he had to go to practically all the important collections or archaeological sites of Europe. Thus the reader becomes acquainted with Europe's leading anthropologists and with



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important discoveries relating to early man.

On one occasion, Field tells us that as an undergraduate student at Oxford, he suggested to Sir Arthur Keith that Rhodesian Man might have suffered from acromegaly, a chronic glandular disease that causes permanent enlargement of the head, thorax, hands, and feet. Keith then rejected the idea. Since the glandular origin of human races is one of Keith's most cherished ideas, Field's remark reads to this reviewer like that of an undergraduate student of physics, who might claim to have suggested the theory of relativity to Einstein. Also, his remarks on the ability of speech in Neanderthal Man are somewhat contradictory. And the name of the German anthropologist to whom he refers is not von Eichstett, but von Eickstedt.

This does not take away, however, any of the extraordinary charm and fascination of this book, which will be extremely inspiring to the average reader. And in the anthropologist who has stayed at home too long, it will create a healthy feeling of unrest.

ALPHONSE RIESENFELD

THE TRIUMPH OF THE TREE

----- by John Stewart Collis

William Sloane Assoc., \$3.50,
276 pp.

FROM the earliest times, when man began to take an interest in his surroundings, trees have excited his wonder and curiosity. This book takes us on an epic journey through the history of man's relationship with them; describing first their place in Nature, then, before their wholesale economic exploitation, those long ages when they were viewed with veneration as the dwelling places of spirits and surrounded by myths and ceremonies, to the present age of destruction and tentative replanting.

From the first page the author is revealed as a man of most unusual mind, highly educated and civilized—a modern tree worshipper as well as a practical man aware of the importance of trees to the world. Trees are the guardians and symbols of the world's fertility, and wherever they have been stripped from the land there has been erosion, the soil has lost its power to grow crops, disastrous floods, famines, and impoverishment have followed. In the deserts and even in the jungles there are buried cities, remnants of civilizations that flourished before the topsoil was washed away. Today the work of denudation proceeds at an appalling pace: each edition of a large newspaper uses over 15,000 trees; each year in the United States the equivalent of 73,000 forty-acre farms is washed or blown away. It is time for us to return to a more realistic worship of trees than our ancestors and to plant before we starve.

For those who are interested in modern problems, this book will be stimulating: for those who love Nature it will provide a wealth of lore concerning those deep significances that trees held for men in times gone by. This book may at times be

incautious, as is befitting a polemic, but it is always readable: indeed, the style is at times magnificent, charged with metaphor, almost rhetorical. Perhaps most of all he regrets that nothing is told about the author, except what can be drawn by inference from that long list of titles to his credit.

NICHOLAS CUPPY

THE NATURAL HISTORY OF MAMMALS

----- by François Boulière

Alfred A. Knopf, \$5.00
363 pp., 97 figs., 24 photos

THIS is a translation from the French and brings together for the English reader a mass of data hitherto scattered through a rather voluminous literature. The author is a competent naturalist, has made a wise selection of material, and has added his own comments as occasion requires. The many good line-sketches and halftones are an important feature of the book. Mention should be made of the valuable bibliography at the close, particularly those works cited in each chapter, which will enable the interested reader to pursue a topic beyond the treatment afforded in the book. The index is a useful addition, which rates commendation because this adjunct is often omitted.

In general, this book discusses the life histories of mammals, their relationships to their environment, the mechanics of their activity, and many of the intimate

details (as exemplified by the chapter on Sexual Life and Reproduction) not often encountered in popular accounts dealing with mammals. It should be mentioned at this point that while the intent has been to make this book "as valuable to the layman as to the specialist" (quoting from the jacket), the full significance of the exposition requires some understanding of scientific terminology.

The treatment of the subject covers such obvious topics as locomotion, feeding habits, defense, longevity, migrations, and so forth. It also includes such aspects as the social life of mammals and the structure and dynamics of natural populations. This is a well-integrated, well-documented analysis of the natural history of the group of animals of most concern to man. It fills a gap in the existing literature on the subject and will doubtless be an authoritative and frequently used reference for years to come.

HAROLD E. ANTHONY

Sources on Conservation

"Free and Inexpensive Materials for Conservation Education" is an excellent bibliography of source references and materials for educators. This 15-page booklet includes classroom aids for grades one to twelve, compiled from state and federal agencies, universities, business, and industry. This booklet can be ordered from Dr. Richard L. Weaver, P.O. Box 2073, Ann Arbor, Michigan for 10¢ each, with a 20 per cent discount for orders of 100 or more.



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Photo by National Park Service

▲ A WONDER OF THE WORLD; Steamboat Rock. The dam will flood it to its tip

Would You **DAM** Dinosaur National Monument?

By **RICHARD H. POUGH**

Chairman, Department of Conservation and General Ecology
American Museum of Natural History

THREE identical bills, H.R. 4443, H.R. 4449, and H.R. 4463, now in the hands of the House of Representatives, Committee on Interior and Insular Affairs, would authorize the construction of a series of dams to store water to regulate the flow of the Colorado River and to generate power. One of the dams, Echo Park Dam, would rise 525 feet high in the heart of the Dinosaur National Monument. Its opponents call it, and all the construction scars, power facilities, and buildings that would go with it, an eyesore that has no place in any part of the National Park system. Certainly it can hardly be said that it would enhance the beauty or wilderness quality of the Monument.

It should be made clear that while the original Dinosaur National Monument was established to preserve the interesting beds and the quarry from which so many dinosaur skeletons have been obtained, the present enlarged Monument was established primarily to preserve the incomparable canyons of the Green and Yampa Rivers in all their wild natural beauty. It is these canyons that would be marred by the proposed dams, not the dinosaur quarry, which is farther downstream. The Monument was established with the proviso that the development of water resources within the Monument would be permitted if necessity should arise; but it now appears clear that the development of the Upper Colorado Valley does not require the construction of dams in the Monument.

The Monument has, as yet, been little visited, because Congress has failed to

provide the National Park Service with the necessary appropriations to develop access facilities. However, during the past few summers more and more visitors have been enjoying the thrilling, yet perfectly safe, experience of "shooting" these canyons in small boats. The proponents of Echo Park Dam ignore this growing use of the Monument as well as the incongruity of a great modern power dam in such a setting. They claim that the reservoir would provide superior access to what would remain of the partly flooded canyons. To the dam's opponents this seems an expensive way to get the public into an area that would be of questionable attractiveness, unless completely full so that the unsightly muddy and heavily ringed shore line was hidden. As the whole purpose of these dams is to provide water to maintain the flow of the river in non-flood seasons, most visitors would have few illusions that they were anywhere but in just another ugly fluctuating reservoir.

General U. S. Grant III, a distinguished engineer who has given the matter a great deal of study, has demonstrated that six per cent more storage capacity can be obtained at alternate sites at a saving of \$54,000,000. It is true that the power-generating capacity would be reduced five per cent and the evaporation loss increased by maybe six per cent. It seems questionable, however, whether it is worth spending over \$1200 per acre-foot to save the water that would be lost. In any case, is

this slight power and evaporation loss too high a price to pay for the preservation of one of the finest units in the National Park system? Since evaporated water sooner or later comes down again as rain, it can hardly be said to be totally lost.

The case for Echo Park Dam is especially weak at this time, as the other units of the Upper Colorado Storage Project have not yet been authorized or built. As these units would provide all the new storage capacity needed for some years to come, the supposed urgency of Echo Park Dam becomes all the more absurd. Even the alternate dams can hardly be said to be urgently needed for irrigation, when the federal government is having to buy surplus crops to keep them off the market.

The whole concept of our National Park system is at stake in this case. Either we regard the areas entrusted to its care as a sacred trust to be passed on, unblemished, to coming generations as a precious part of our American heritage, or we can expect to have them all artificialized in time when some selfish local group can concoct a plausible enough reason for doing so. This is truly an issue on which no one can be neutral, and it is the duty of every citizen to let The Honorable A. L. Miller, Chairman, House of Representatives Committee on Interior and Insular Affairs, House Office Building, Washington 25, D.C., and his own Congressman, know how he feels about the matter.

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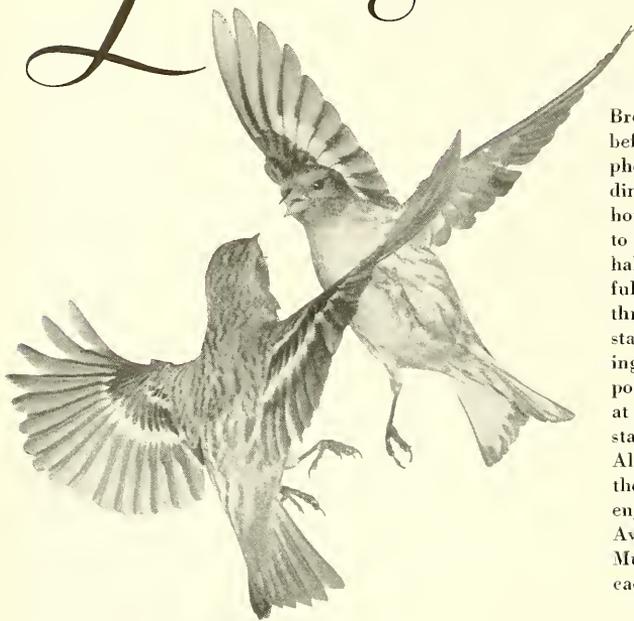
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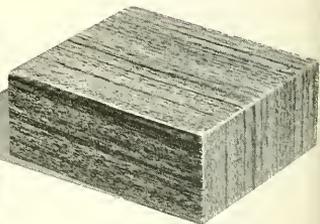
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Photo by Don Knight

▲ LONE CYPRESS on Midway Point—17 Mile Drive, Carmel, California

LETTERS

Early Bird

SIRS:

Some days—not every one but sometimes two or three in succession—a blue jay darts into the thick Scotch fir outside my window about 3:30 P.M. As nearly as I can see, he puts his head under his wing and does not move again, apparently remaining thus all night.

When I get up after daylight, he is gone.

Is this normal; or is he out of health? I had no idea birds went so long in daylight without eating.

M. E. BAKER

New Bedford, Mass.

Dr. John T. Zimmer of the American

Museum's Bird Department offers the following comment:

Miss Baker should have no occasion to worry about her Blue Jay. If it were ill, it would not make an early start on its daily hunt but probably would stay inactive all day.

There is little on record concerning birds' timing for going to bed, but there should be much variation among individuals. If this jay gets well fed by late afternoon, it probably is satisfied to stop looking for more. Days when the bird doesn't go to sleep at the same early time, it probably had less success in getting fed. At any rate, its internal "clock" seems to be set for 3:30 if it can make it.

Incidentally, birds do not sleep with their heads *under* the wing but *on* it under the mantle feathering of the back.

Boars off Their Beat

SIRS:

I have seen occasional newspaper reference to a herd of elk and wild boar that have become established in New Hampshire. Can you tell me anything about these animals and about any other wild animals that have been introduced in this country? I have also heard of a herd of wild boar in the Tennessee-North Carolina mountains.

CHARLES B. NICHOLS

Anderson, S. C.

T. Donald Carter of the American Museum's Department of Mammalogy gives the following information:

In about 1888, Mr. Austin Corbin, owner of a large estate near Newport, New Hampshire, fenced in a large acre-



Photo by Nicholson from Hugo H. Schroder

▲ KINGBIRD brooding in nest in Florida

age and introduced a number of game animals including bison, elk, and wild boars. Some of these animals escaped into the near-by country and increased in numbers. I do not know the present status, but I do know that some of the wild boars are still there. It would not be difficult to find out more about them by writing to the New Hampshire Game Commissioner.

The wild boars of Tennessee and North Carolina are of more recent origin. There are conflicting stories about their importation, but they are now believed to have been brought over from north Germany in 1912 by a man named George Moore. Mr. Moore leased a large piece of land to be used as a hunting area and to promote a hunt club. In time, this idea fell through, but many of the boars escaped into the surrounding forest. The site was near Hooper's Bald, N. C., which is near the Tennessee line. The boars have now spread over much of the surrounding territory, being chiefly found in the northern Cherokee National Forest in Tennessee. They have crossed extensively with the half-wild native pigs, so that by now most of the animals have some domestic blood. They are protected to some extent in both states, and special licenses have to be purchased in order to hunt them.

Articles concerning these boars may be found in *The Hunter's Encyclopedia* and in the *Journal of Mammalogy*, 1938, vol. 19, pp. 279-290. *Field and Stream* has

had a couple of articles on the hunting of these animals.

**Come Birds!
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If you have a clothes drier, you have an excellent chance to have many bird friends. Each time you clean out the wire tray at the bottom of your drier, save what you collect. It will include lint, thread, and even bits of string or feathers if your laundry included rugs or pillows. The birds will flock to your weekly donation box if it is placed outside for them. Each new nest they build during the summer should be lined with your drier's deposit. You have to clean it out anyway, and the building material will bring many happy days to the bird finders. Start your "bird box" now.

MRS. JEAN LYON

Sounds from the Southwest

A new record, "Sounds of the American Southwest," containing sounds as remote from the noises of civilization as the purring of a mountain lion, the hooting of a horned owl, and the stridulations of a cricket, has been prepared for those who are lonesome for the wide-open spaces.

Book Club Notice

Opportunity is taken to inform readers of *NATURAL HISTORY* Magazine that the Natural History Book Club, which was

The twelve-inch, long-playing record was taped by Charles M. Bogert, Chairman of The American Museum of Natural History's Department of Amphibians and Reptiles, during a collecting expedition last summer.

According to Mr. Bogert, the sounds recorded are those that anyone traveling in the arid portions of Southern California, Arizona, and New Mexico might hear during a single summer. These sounds are unbroken by narration: doves, mockingbirds, robins, rattlesnakes, grosbeaks, kingbirds, woodpeckers, owls, crickets, toads, frogs, bobcats, beetles, javalinas, and a mountain lion, whippoorwill, hummingbird, thunderstorm, and flash flood are all heard without interruption in "Sounds of the American Southwest."

The record claims more than aesthetic value, however. In a pamphlet that accompanies it Mr. Bogert explains the seasonal and daily sequence of the natural noises and also considers why individual groups of animals such as amphibians, reptiles, birds, and mammals make noises.

The record has been released by Folkways Records and may be obtained by mail or in person at The American Museum Shop as well as at music stores. The record costs six dollars and ninety-five cents, plus thirty cents to cover postage on mail orders.

SIRS:

... I found the article "Plant Or Animal?" (January, 1954) very fascinating. I felt like going out to gather some slime molds right away. I think that one thing that makes your Magazine so good is the fact that it appeals to many kinds of people... I don't believe it could be better.

RUTH STEWART

Greensburg, Penna.

SIRS:

... In closing, I would like to offer congratulations on your new cover style. The last three have really been objects of beauty. I hope that your magazine will be able to carry on the fine tradition it has maintained throughout the years.

DICK SCHNEIDER

University City, Mo.

**National Park System
Sets New Record**

For the eighth straight year, the total number of visitors to the 180 areas administered by the National Park Service set a new record. The count reached 46,224,794. Eleven areas attracted more than a million visitors each. Yellowstone drew 1,326,858.

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April, 1954
Volume LXIII, No. 4

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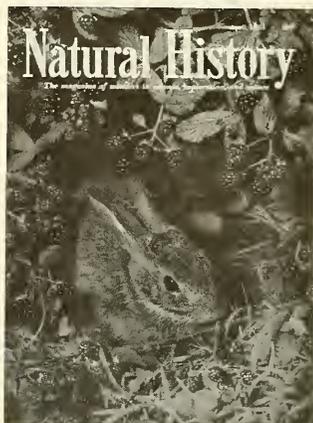
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Each stream measures the way man has lived with nature and gives warning while the landscape may yet be saved from abuse

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Champion conservative, it has scarcely changed in half a billion years. But it has found a home in many lands around the earth

The Screen 188

Yosemite's "Century Avalanches" Fran Hubbard 190
How the summer visitor can detect signs of snow slides, old and new

You will find NATURAL HISTORY Magazine indexed in Reader's Guide to Periodical Literature in your library



THE COVER THIS MONTH

The Cottontail Rabbit is one of the best known of our native mammals. Given a briar patch or other thick cover for a safe retreat, it is as much at home in a suburban backyard as in a hillside pasture lot.

From four to eight young generally constitute a litter, and three or four such litters may be produced each year. The nest is a depression on the surface of the ground, well hidden in the grass or other cover, and is lined with the mother's fur. The young are born blind and without hair but grow rapidly and are independent from the mother in less than a month's time. It is fortunate for the Cottontail that it is so prolific, as it is constantly being hunted, not only by man but also by the larger birds of prey and by the carnivorous mammals.

The many forms of Cottontails are found throughout most of the United States and from southern Canada south into central South America.

The photograph was taken by Jack Dermid.

T. DONALD CARTER

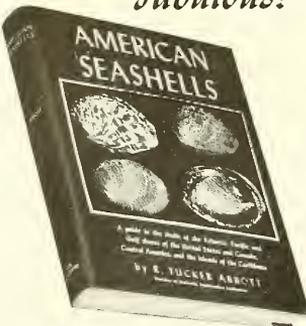
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THE CONQUEST OF EVEREST

by Sir John Hunt

With a chapter on the final assault
by Sir Edmund Hillary

E. P. Dutton, \$6.00
300 pp., 62 illus.

THOSE lucky enough to have seen the great mountain wall of the Himalaya ranges, which so forcefully separates the peninsula of India from the rest of Asia, have viewed one of the greatest natural splendors of the earth. To the people of much of Asia these ranges mark the roof of the world; among the peaks that uphold that roof the legendary homes of the gods can be found. The peak of Chomolungma, or Mt. Everest, is a kind of 'seat imperial' for the greatest of the gods. It can be attained only by immortals or by those who do deeds worthy of the gods. Sir John Hunt and his comrades seem, therefore, to have accomplished such a feat. Certainly in terms of human history it is a fitting climax to the centuries of geographical exploration that have ensued since prehistoric men left their caves to go "beyond the hills."

The author tells in some detail how this deed was accomplished: the problem, the preparation, the personnel, the special equipment, the training, the voyage, the making of a team out of individuals, the slow advance, the gains and losses, and the accomplishment. All of this is beautifully illustrated in black and white and in magnificent color.

It is difficult not to eulogize about this book. It is far more than an account of an adventure or a tribute to courage and determination. It is, rather, a magnificent example of idealism and in turn a dedication to that idealism, which seems almost foreign to the modern world. The selflessness, the mutual understanding and respect, and the strength of mind reached the apex of spiritual expression on the slopes of Everest just as surely as the utmost in physical strength was required in the achievement of the summit. Sir John Hunt underlines this in his reflections on the effort:

"Was it worth while? For us who took part in the venture, it was so beyond doubt. We have shared a high endeavor; we have witnessed scenes of beauty and grandeur; we have built up a lasting comradeship among ourselves and we have

seen the fruits of that comradeship ripen into achievement. . . .

"There is no height, no depth, that the spirit of man, guided by a higher spirit, cannot attain."

WALTER A. FAIRSERVIS, JR.

THE LIMITS OF THE EARTH

by Fairfield Osborn

Little, Brown and Co., \$3.50

RECENTLY the Food and Agricultural Organization of the United Nations had to report that despite unprecedented efforts to expand the world's food supply, only a 9 per cent increase had been achieved during a period when the world's population increased 12 per cent. *The Limits of the Earth* is an examination of the facts underlying these statistics. Continents by continent Mr. Osborn examines the present resource situation and the potentialities for future expansion. Special attention is given to the Amazon Basin and other tropical rain forest areas that so frequently delude the unthinking because of their size. After an examination of the biological and social problems involved in such tropical areas, he concludes that there are as yet no reasonable grounds to support the hope that the Amazon can become a great producer of exportable surpluses.

Mr. Osborn is, however, interested in more than just food, and at one point he asks the pointed question, "Have we, as civilized people, really focused our attention upon the most vital aspect of this complex question of living space, congestion, food surpluses and deficits? Are we not running such a busy race after food, space, and employment for ever greater numbers that we are forgetting the purpose of it all—a better living for human beings? What is humanitarianism? Is it trying to disperse and feed more people or is its objective a better quality of living for each individual and for mankind as a whole? Do we really wish to see how much pressure the earth and the human spirit can sustain, or are we concerned with fostering the well-being of each infant, whose life is the responsibility of the collective 'us'?"

An interesting chapter, *Horizons and Mirages*, examines the various schemes that have been proposed for feeding the world on sea food, yeast, algae, or wood

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Of course Norman Ford knows where to get real vacation bargains from Maine to California and in Canada, Mexico, etc. At no time does he ask you to spend a lot of money to enjoy yourself, no matter how really different and exciting is the vacation you choose through his experienced advice. Always, he tells you the many things you can do within your budget and how to get more for your money. If you travel by car, he shows how most auto parties can save \$6 and \$7 a day.

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Luxury Hotels in Florida, Cuba, Bahamas from \$2.50 a day. Summer brings down the rates in the leading hotels here. And it's no warmer than New York, Boston, or Chicago. Thousands now spend their summer vacations in Florida, Cuba, and the Bahamas, yet spend no more than at an ordinary resort—ap north.

A week's cruise into the Canadian North Woods for \$55. From Canadian towns easily reached by car, steamers sail weekly along rivers and lakes into the roadless North Woods of fur trappers and red coated Mounties. Chances here to leave the ship and canoe far north into the deep Indian forests.

Acropolis for only \$17 round trip from U.S. border. Vacation in summer at Mexico's exotic tropical beach resort for only \$37.50 a full week, all expenses included.

Grand Canyon on \$3 a day. Camp out at half a million American families do. Housekeeping tents also available at this and other national parks. (Vacation at the famous parks for less than you'd spend at home.)

Round the world for \$498. Minimum fare from London (freighted for \$175 from N. Y.). From U.S. round the world cruises on luxury type freighters from \$250-\$300 a month.

Rail to New York or California via Florida and Canada. Only \$8 more than the usual cross-country rail ticket entitles you to visit not only the two coasts but also Jacksonville, Banff or Jasper Parks and Montreal.

Your own private beach for only \$15 a week at Grenada. The tropical island in the West Indies which natives say is as colorful as a rainbow. Sea bathing, sailing, fishing, golf and tennis yours for only \$3-\$5 a day for two—total expenses, including meals and house.

Unfortunately, it's not easy to shop around for real travel values—for many of the best low cost vacations never are advertised. Yet the secret of guaranteeing a new, different and exciting vacation is to learn the hundreds of things you can do and the places you can visit on the money you want to spend.

I've spent months doing nothing else than travel around to find the best vacation bargains in all North America. I have found low cost summer paradises; have learned scores of ways to save and can tell you about the vacation-out-of-the-ordinary that is just what you've been looking for.

If you are interested in visiting America's outstanding cities for less than \$8 a day... in spending your vacation on a real, operating dude ranch for only a few dollars a day instead of \$20... if you and your family need a vacation and have only \$35 a week to spend... if you seek Parisian atmosphere without traveling all the way to Europe... I will show you that it is cheaper to vacation than to live at home.

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as told to Baynard Kendrick. With 16 pages of illustrations. \$3.50 at all bookstores.

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and using desalted sea water for irrigation. Intriguing as these schemes are, he is forced to conclude that none seem likely to increase the world's food supply at rates anywhere near comparable to the rate at which populations are currently increasing.

"The Hour of Decision" is a forceful statement of the realities of the present world situation, in which Mr. Osborn points out that there are limits to the earth and to its ability to produce food. This makes it imperative that man take steps to place limits on the earth's population. If he does not, of course, nature eventually will. In answer to those who claim that artificial population limitation is unnatural and, therefore, immoral, he points out that medical control of disease is also unnatural.

In conclusion the author says, "It is profoundly hoped that this book will throw the light of realism on these urgent questions, and, among other things, will dispel illusions regarding imaginary new horizons. . . . It will be time to conjecture how many people the earth is capable of supporting when the increase in the production of vital resources from agriculture, or through other means, is demonstrably keeping pace with population growth. This it is not now doing."

RICHARD H. POUGH

THE FABULOUS INSECTS

----- Edited by Charles Neider
Harper and Bros., \$3.50, 278 pp.

THIS anthology consists of 24 selections from the writings of 17 authors, almost all still living. Fabre, who died in 1915, is the most remotely dated writer represented. Although the title of the book emphasizes insects, the editor gives relatively generous space also to arachnids, to the inclusion of some interesting observations of his own on the particularly poisonous members of this group. In so widespread a range of interest it is inevitable that conspicuous gaps must occur, but these gaps are perhaps accentuated by the editor's recurrent devotion to certain groups of insects, thereby curtailing the space that might have been available to other claimants. Thus at least three articles are given in whole or in part to the army ants and two to the honeybees. Additional articles dedicated to the Hymenoptera give this order a prominence that nevertheless is not undeserved.

Sometimes there is in my estimation too great a partiality shown for the sensational, climaxed in such articles as "Buzzing Death" (presumably an account of *Apis dorsata*) and "Ants that Kill Elephants." The sanguinary aspects of insect life receive additional emphasis in such articles as "The Terrible Praying Mantis"

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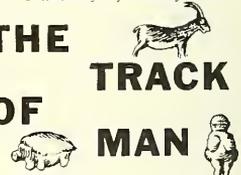
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University of Pennsylvania

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N.Y. Times Book Review

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The Horn Book: "Held our admiring attention both for the beauty of its black and white pencil drawings and the interest of its well-arranged material. Young people who can absorb a great many facts will love the sections devoted to physical characteristics of the mallard duck. Speed of flight, powers of vision, feeding, diving, and moulting are clearly explained, the writing aided by many appropriate drawings. The dangers that beset our wildlife and the measures taken by our government for the study and protection of migratory birds are carefully and interestingly explained. Campers and scout groups should take note of this book."

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and "Ant Warfare," not to mention incidental reference in other articles.

Of interest to readers of *NATURAL HISTORY* will be the fact that four of the articles included had their origin in this magazine. Also, three of the authors selected for the anthology are members of the American Museum's scientific staff.

The book represents a selection of articles that may well stimulate further reading in the inexhaustible insect field. Possibly the desire to avoid an impression of heaviness restrained the editor from adding so much as a single footnote or introductory comment (except for one paragraph in the Introduction itself). This dispensation of editorial guidance may make for unencumbered reading, but it also deprives the more serious reader of a valued aid.

HERBERT F. SCHWARZ

HOW TO KNOW THE SPIDERS

- B. J. Kaston and Elizabeth Kaston
Wm. C. Brown Company, Dubuque, Iowa
220 pp., 552 illus., \$2.25

THIS "How to Know" book aims to give the beginner and general reader a graphic picture of our common spiders and their activities, and it succeeds in wonderful fashion. The talents of one of our finest arachnologists have been enlisted to produce a concise, authoritative treatment of a quite difficult group, and his wife Elizabeth has provided more than 500 illustrations, all of which are marked by her fine artistry. The pattern of the book parallels closely that of other volumes of this successful nature series.

In an introductory section one can find answers to most of the common questions about spiders and practical instructions on where to find and how to collect and preserve them. Identification of the 40 families and 271 species is made relatively easy by the superb pictured-keys, and one or several illustrations are allotted to every included species.

The professional arachnologist, who will also find profit in having this book, will detect a few nomenclatorial lapses and regret that spacial limitations made necessary a consideration of only a small portion of our fauna.

WILLIS J. GERTSCH

WHAT THE WORLD SHOWED ME FROM THE ARCTIC TO THE JUNGLE

----- by Per Høst

Translated by Katherine John
Methuen & Co., Ltd., London
224 pp., 56 photos, 13 color plates

NOWADAYS it is rare to find a scientist who does not write a popular book about his experiences, but it is quite

continued on page 192

This book
reveals the
secrets of

The Fabulous Insects

Edited by CHARLES NEIDER

The first of its kind, this remarkable collection includes twenty-four fascinating stories of insect life by the world's foremost nature writers of yesterday and today—Jean Henri Fabre, Donald Culross Peattie, Edwin Way Teale, William Beebe and many others.

- How the Army ant makes war
- Spiders which lasso their prey
- The intriguing habits of termites

These are a few of the extraordinary subjects in this colorful, lively book. Written in non-technical language, the selections are popular nature writing of the highest order.

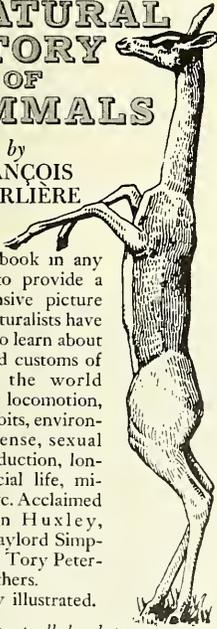
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ALFRED A. KNOPF, Publisher



Hints for Happier Holidays

Idaho's jagged Sawtooth Mountains hold out a hearty welcome to those who hear the call of the wild. And there are ten other wilderness trips conducted under the auspices of The American Forestry Association

Trail Riding in the Wilderness

By BERNICE GOETZ

LYING in your sleeping bag in the predawn stillness, do you like to watch the deer pass through your camp? Are you willing to admit, when the "lruumph" of a bear surprises you in a berry patch, that he has first rights?

Then the call "Riders Up!" resounding down steep canyons and along high trails next summer will arouse you from city lethargy and send you on a stirring vacation into wilderness areas. In 1953, about 300 hardy Americans found a way to explore some of the far, silent places still existing in the United States.

Not until I opened one of the American Forestry Association's folders labeled "Trail Riders of the Wilderness" had I known there was a way to travel into just the kind of country I wanted to see. For me,

wilderness must be *wild*. There must be unbridged streams, high meadows fresh with flowers and signs of elk, or the possibility of mountain goats along the ridges.

The pamphlet I looked at gave me a choice of seventeen Trail Rides into the recesses of our National Forests, from the "Great Wall" in the Northern Rockies to the last stretch of wilderness in New Mexico, including two expeditions by canoe through the waterways of the Superior National Forest of Minnesota. There was a

tantalizing array of regions—High Uintas, (Utah), Maroon Bells-Snowmass (Colorado), Cascade Crest (Washington).

Perhaps you've always wanted to go but have wondered where to begin—and then, with a shrug, decided it was all too complicated anyway. I learned in this booklet that I had only to be a reasonably healthy person and possess some knowledge of horseback riding. For an average cost of \$20 a day, my food was provided, as well as a doctor for emergencies and an As-

▼ THE PACK TRAIN is up early, and woe betide the Trail Rider whose bed roll isn't ready

U.S. Forest Service photo, courtesy American Forestry Ass'n.





The many Trail Rides offered by the American Forestry Association, promise outdoor adventure you'll not soon forget

Expedition	Duration	Dates	Maximum Persons Permitted	Description	Price
A Flathead-Sun River Wilderness, Montana	12 days	Monday, July 5 to Friday, July 16, and Friday, July 16 to Tuesday, July 27	25 riders	A million acres of bold mountain beauty, sparkling lakes, dark canyons, and flowered valleys. Elevations: 6,000 to 12,000	\$215 from Missoula, Montana
B Quetico-Superior Wilderness, Minnesota	10 days	Saturday, July 10 to Monday, July 19	15 canoeists	One of the continent's greatest water wildernesses. A vast country of island-studded lakes, rushing rivers, and excellent fishing	\$195 from Ely, Minnesota
C Shoshone-Yellowstone Trail, Wyoming	11 days	Tuesday, July 20 to Friday, July 30	25 riders	Shoshone National Forest and back country of Yellowstone National Park. A new trip for Trail Riders	\$215 from Cody, Wyoming
D Maroon Bells-Snowmass Wilderness, Colorado	11 days	Wednesday, July 21 to Saturday, July 31, and Tuesday, August 3 to Friday, August 13	30 riders	A land of towering peaks, alpine lakes, and rushing streams	\$215 from Glenwood Springs, Colorado
E High Uintas Wilderness, Utah	11 days	Monday, July 26 to Thursday, August 5	26 riders	Rugged peaks mirrored in numerous lakes. Forests and vast grassy basins bright with flowers. Good trout	\$215 from Vernal, Utah
F Sawtooth Wilderness, Idaho	11 days	Tuesday, July 27 to Friday, August 6 and Tuesday, August 10 to Friday, August 20	25 riders	A spectacular ride through pine forests with the high chalklike White Cloud Mountains in the distant background	\$205 from Sun Valley, Idaho
G San Juan Wilderness, Colorado	11 days	Friday, August 13 to Monday, August 23 and Saturday, August 28 to Tuesday, September 7	25 riders	This remote wilderness in the heart of the mountainous San Juan National Forest excels in scenic beauty and fishing and the things Trail Riders want	\$215 from Durango, Colorado
H Wonderland Trail, Mt. Rainier National Park, Washington	11 days	Sunday, August 15 to Wednesday, August 25	25 riders	This is another new trip for Trail Riders	\$210 from Paradise Inn, Mt. Rainier National Park, Washington
I Glacier Peak-Lake Chelan, Washington	12 days	Thursday, August 26 to Monday, September 6	25 riders	Here is one of the most scenic gems in the nation-Lake Chelan. It is 55 miles long, sunk in a beautiful green forested canyon	\$215 from Wenatchee, Washington
J Sequoia-Mt. Whitney Wilderness, California	10 days	Wednesday, August 25 to Friday, September 3	20 riders	Snow fields and shadows set this mighty wilderness apart from other areas. Breath-taking views	\$210 from Lone Pine, California
K Pecos Wilderness, New Mexico	12 days	Wednesday, September 8 to Sunday, September 19	25 riders	A land where the Spanish influence is still strong. Its rugged hinterlands, forested ridges, and parklike mesas give it a distinctive charm	\$215 from Santa Fe, New Mexico

Further details can be secured from the American Forestry Association, 919-17 Street, N.W., Washington 6, D.C.

sociation representative to carry out policies and routing. My duffel must not weigh over 50 pounds, including a sleeping bag and air mattress. The gear would thus be reduced to essentials - blankets, change of shirts and jeans, warm underwear for frosty mornings, and a few toilet articles.

I decided upon the Sawtooth Mountains in Idaho because of the jagged scenery they promised. The eleven-day ride would enable me to return to our point of departure - in this case, Sun Valley, Idaho - and get back home easily within my two weeks' vacation from the office.

Today's trips are still patterned after the first pioneer ride in 1933 when 2 guides, 2 cooks, a boss packer, 4 wranglers, and 55 horses and mules led 22 riders into the Bob Marshall Wilderness area from Helena, Montana. Since then more than 2600 riders have been on 142 expeditions in 12 states. Half of them have repeated the ride, and

► BLEAK PEAKS FROWN DOWN on Upper Baron Lake, where a stop was made for lunch

Bernice Goetz photo



some have taken from five to twelve trips. Forest Service rangers accompany the party part of the way, teaching riders how forest fires start and are controlled, the reasons for fish and game laws, and pointing out the firs from the spruces. The Association's primary interest is to make friends for the wilderness and for the government bureaus managing the lands.

When we gathered at the Challenger Inn in Sun Valley the night before leaving, Charles I. Daugherty, Forest Supervisor in charge of the Sawtooth National Forest, was on hand to acquaint us with the immense stretch of forest through which we would travel. In our circle route, we would also enter the Boise National Forest, returning to the Sawtooth Valley again.

Looking at the strangers with whom I had elected to spend my vacation, I was impressed with the variety of types. All of us had been drawn together with one objective

in mind—to satisfy a craving for the scent of pines in thin air, to gaze at lofty crags that would lift us away from our mundane occupations. Our AFA man was Ken Davis, formerly a Montana forest ranger, now a professor at the University of Michigan. There were two doctors, a society matron, a physiotherapist, a social worker, several secretaries, some gentlemen farmers with their wives and teenage sons and daughters, and a schoolteacher.

On the steps of the Inn the next morning, ready for the 60-mile trip by bus to Alturas Lake, our Stetsons, levis and boots made us one common human denominator envied by the other guests. Our duffel, packed in regulation zipper bags, was a mountain of green and brown canvas. Now we could understand why we had been limited in weight.

We were 23 riders in all when we arrived at the edge of the lake. There we met Claude Gillespie,

veteran wrangler since 1937 when this Trail Ride originated in the Sawtooths. After one sweeping glance from Claude, in which he judged my avoirdupois hidden behind two knapsacks of cameras, I was on my way atop "Coco," a conservative mare.

Through roaring streams, over tilting snowbanks, and up the escalator trails, Coco carried me safely with the hardheaded sense of a mountain-bred horse. The horselaugh was on me, however, when I tied her to a fir tree so short that she stepped on it and then sat on her haunches because it tickled her tummy. Once when a rock jounced off a switchback on a bad turn and struck her flank, Coco's presence of mind saved both of us. Lurching away from the impending depths, she recovered her balance, walked a few steps, and then, womanlike, stood trembling.

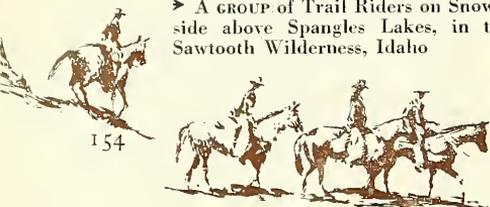
At our first camp, we learned that Trail Riders are not waited on. You collect your own duffel at the end of the day, carry it to your tent, blow up your air mattress, and in the morning roll it neatly and have it waiting for the packer by 7 A.M.! Last call for breakfast at 6:30 A.M. means that late sleepers are not permitted to upset the working pattern of the day. With 70 head of horses and mules to saddle and pack, Claude's wranglers were up at 4 A.M. driving them into camp. On this 115-mile trek, our camp site would be gov-

Bernice Goetz photo



▲ DOROTHY, the writer's tentmate, and the teen-agers, together with a shepherd's dog, at the start of the climb up to Glen's Peak

➤ A GROUP of Trail Riders on Snowy-side above Spangles Lakes, in the Sawtooth Wilderness, Idaho



American Forestry Association photo



erned by location of pasturage. Horse feed is a basic problem on trips into high country, because grain cannot be conveniently carried along.

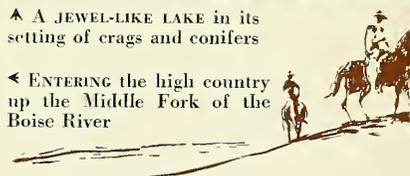
We watched the jovial kitchen crew pack our supplies. The Williams family—Ted, Ethel, and red-headed daughter Mitzi—were accustomed to packing hundreds of eggs in straw without casualties. They stored away tomatoes and lettuce that would re crisp nightly in icy streams, stowed cans of whole chicken and ham, and patted the cantaloupes tenderly. Since Idaho is sheep country, lamb carcasses for barbecuing hung on high limbs each night. With expert packers along, modern menus *à la* "Chuck" (out West, it's never "chow") could be pleasingly varied. Breakfasts of hot cakes, eggs, and bacon dispelled the shuddering cold in the morning. Then, at our first rest stop, the kitchen string would pass us. Tea and sandwiches were sufficient at noon to keep us

Bernice Goetz photos



▲ A JEWEL-LIKE LAKE in its setting of crags and conifers

◀ ENTERING the high country up the Middle Fork of the Boise River



from rolling off our saddles in the heat; and by the time we again spied wood smoke curling out of the long stovepipe, the kettles would be bubbling. "Ride hard and eat large" was a safer philosophy at the close of the day.

We headed for the drainage of the Middle Fork of the Boise River. When we first gazed at the tremendous shelvings of rock building up before us, we had to gear our perspective to the final majesty of Blizzard Mountain on our left and Mattingly Peak on the right. A coyote helped us out. It was crossing a strip of snow halfway up the





▲ "WONDER what we're going to have to eat tonight," these hungry Trail Riders are asking each other



▲ THE "WORKING GUESTS" pitch in to wash dishes



Bernice Goetz photos

mass, and it stood for a moment with one paw raised, looking at us curiously. In proportion, it was mouselike.

Our lunch spot one noon was overshadowed by Glen's Peak, towering 10,065 feet above. Spangle Lake at its base shimmered like its name and reflected facets from the snowbanks around its rim. At one end, a spongy meadow was covered with yellow cinquefoil bobbing like buttercups in the chilly air. Pioneer Trail Riders who climbed Glen's Peak in 1937 had left their names in a cairn at the top. Only six on this trip added their cards to the collection, while those of us who stayed near timber line listened to the occasional muted notes of birds in the tops of gnarled white bark pine. The music drifted thinly up to us until it was lost, together with our egos, in the expanse of tumbled ranges and river basins stretching away from us.

In the bigness of this country, we were losing our labeled individualities. By the end of a day's ride through powder-dry river bottoms, the gentleman farmer was the same color of dust as the wrangler, and the ladies had long since packed away their cosmetics. The Long Island matron was gaily helping with the dishes. Even quiet John, former Swiss alpine-climber, spoke a few rapturous words when the trail

reached its most spectacular heights above Twin Baron Lakes, where Baron Peak rears 10,307 feet and Warbonnet Peak tilts sternly toward you in the west. Lower Baron Lake attracted the attention of the fishermen, but the shaly switchback offered no stopping place. Several thousand trout had been planted in the lake in 1938, being packed in by horse in ten-gallon milk cans. Since then, planes have been used to stock almost inaccessible lakes.

Since we stayed steadily at altitudes of 6000 to 8000 feet and higher, our enthusiasm over the variety of alpine flowers and herbs never abated. Using Walter Pesian's field book *Meet the Natives*, my tentmate and I sought species more rare than the myriads of columbine, blue asters, Indian

paintbrush, and purple fireweed which thrived everywhere. When Dorothy discovered that the fire-red spikes waving on grassy knolls were Fairy Trumpets (*Gilia attenuata*) fluting soundlessly in the sunlight, I countered by finding a Blue March Gentian (*Gentiana affinis*) hidden in damp sedge. Mountain Beardtongue (*Penstemon alpinus*), Fendler Meadow Rue (*Thalictrum fendleri*), and Bistort (*Polygonum bistortoides*) became familiar to us.

As every fourth day was a "rest day," Dorothy and I would walk back along the trail or climb a shoulder of the mountains to get away from the hubbub of camp and corral. Up Baron Creek Canyon, sego lilies luxuriated in dark glens, although some braver mem-

▼ CAMPFIREs kindle good companionship and tales of the day's adventure





▲ LAKE INGEBORG: Trail Riders surveying the austerity of a garbled and wind-blown timber-line region

▲ FAR FROM THE DIN OF CITY LIFE, the Trail Riders refresh their spirits in scenes of tranquil beauty

▼ MT. CRAMER overshadows Hell Roarin' Lake and is mirrored in its surface

bers of this tulip family nodded their pale lemon heads with the purple markings out in open sunlight. Near a cluster of quaking aspens, we flushed a family of Franklin Grouse which were almost indistinguishable in the grass. Mother Grouse, true to her nature, stood in plain view on a log with bright eyes blinking nervously, while the five youngsters disappeared. Deep in the shade of Douglas fir, we found a spring from which sweet water flowed into a tiny trilling stream down the hillside. There, Bog Wintergreen (*Pyrola asarifolia* var. *purpurea*) grew with lush, furry leaves. In the middle of each cluster, a pink spiral of blossoms rose.

We discovered that the noise of pitching camp whetted the curiosity of Western Tanagers. They would perch daringly close to our tent and watch us blow up our air mattresses. Scraps of colored paper fascinated them, and their red crests, chartreuse breasts, and orange wings were a constant flickering aura over the rubbish pit.

The Rocky Mountain chipmunks were the funsters of the camp. They climbed into buttoned pockets to filch candybars, and one was bold enough to sit in front of a package of cookies and select his own fig newton!

Perhaps it was just as well that the trout were wary and the fish-

continued on page 191



Photographs by

C. W. TEAGER



▲ STARLINGS FIGHT FURIOUSLY among themselves. These photographs, which come to NATURAL HISTORY from England where our starlings originated, give better than a bird's-eye view of their hostilities

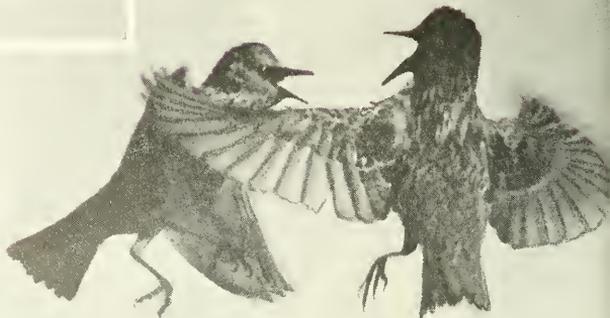


▲ THE FEET especially are used as a weapon of attack



▲ NOTE HOW the birds keep their bills open most of the time

► A NICE ILLUSTRATION of the wing feathers at full spread



▼ WHEN SPRING ARRIVES, the flocks will break up into pairs, each one setting out to find a convenient nesting place—a hole in a tree, a bank, or an old water spout, where a family can be raised



A Bird in the Hand— will drive two from the bush

Communities plagued by thousands of starlings have tried to banish the birds by every imaginable method. The remedy, just discovered, is almost too simple to be believed

AN anti-starling campaign waged last summer by citizens of West Orange, New Jersey, shows how acute the problem can become. Angered by the birds' tendency to soil the sidewalks beneath their roosting trees, and by the suspicion that the birds were eating grass seed and repelling the songbirds, the townspeople declared war. They placed stuffed owls in the trees and played recorded hoots at the starlings. The fire department tried to squirt them out of the trees with their strongest hoses, but without lasting success. In the end a number of the townspeople resorted to cutting down their trees.

Just as this issue of *NATURAL HISTORY* goes to press, news comes of a remarkable remedy. It has been shown that if you hold a starling by the legs and shake it, the shrill dis-

stress call it utters can be used to drive away the starlings that roost in dense colonies. This method was used to banish all but about 200 of the 20,000 starlings inhabiting an area of about three square miles in State College, Pennsylvania, as described in a report by Hubert Frings and Joseph Jumber of the faculty of Pennsylvania State University. The account was published in a recent issue of *Science*, the official periodical of the American Association for the Advancement of Science.

The piercing "alarm call" was recorded and played back with amplification from a sound truck intermittently for about an hour at sundown. In repeated tests at State College and Millheim, Pennsylvania, the starlings were banished from every area in from two to five "concerts."

The loudness of the sound from the horns was measured at 120 decibels a meter from the speaker. This raises the question whether the townspeople might not have preferred the birds to the remedy. Not so. The sound was not disturbing to human ears when directed upward into the trees. The birds remained away until they left the region for the winter, in October.

The warning call of the starlings did not affect grackles and robins, which were present in the area.

Strangest of all, trees from which the starlings had been frightened were avoided even by starlings from other roosts. The birds would fly toward the trees as if to settle in them and then veer off as though they detected some warning. This puzzled the observers and could not be satisfactorily explained.

—THE EDITOR



This article, in two parts, is drawn from a book that will be published in May: *Treasure Diving Holidays*, by Jane and Barney Crile (Viking Press, Inc.)—Ed.

Salt-water Solo

Vacation adventures of a family who went down to the sea in homemade diving equipment to discover the underwater wonderworld of tropic seas

By JANE AND BARNEY CRILE

Photographs by the authors

▼ THE CRILES ready to put to sea in a rubber life raft, which formed a floating base for their underwater photographic equipment. Left to right: Susie, Ann, Barney, Jane, Joan, and George





▲ IN QUEST of the clearest water in the Northern Hemisphere, the authors went to the Bahamas and chartered this native out-island sailboat, the "Progress." On the erratic voyage that followed, they sometimes knew no more about what lay ahead than Columbus did

Part I

FOR years Barney had done his diving in the bathtub, lying under the suds, holding his breath until his face grew purple. Instinctively, he had been practicing for the day when he would cross the threshold between land and sea, with the children and me following happily behind. The first step out of the bathtub was into a diving hood, and it was a misstep, nearly as dangerous as stepping on a cake of soap.

When you go down in a diving hood, the one thing you must take with you from the world above is a little air. I wanted to have as much as I could, so when Barney and I built a diving hood we designed it big and square, a 1934 version of a Martian space helmet. Progress was slow because Barney was in the midst of a surgical internship that kept him busy sixteen hours a day. On off-weekends we cut the pattern from cardboard and modeled it to fit over our heads and shoulders. We clothed the hood in sheets of galvanized iron, endowed it with a glass cyclopan eye, added a complicated telephonic ear, and gave it a tinny voice, through which I could plead for air. The hood grew heavy with lead. Through 50 feet of hose we pumped the breath of life into the ponderous one-eyed monster. It was com-

plete, and ready to turn upon its creators.

Undaunted by the fact that it was November in Cleveland and Lake Erie was almost due for its seasonal ice pack, Barney put on the hood and waded out into the muddy water. He kept walking deeper and deeper and walked right out of the hood which, refusing to co-operate, floated obstinately on the surface. I was still pumping air violently, and big bubbles were escaping from under the hood when Barney came sputtering to the top.

"It's going to take a ton of lead to sink this balloon," he said, and he was almost right. We had squared instead of cubed our figures, and it required nearly a hundred pounds of lead to persuade the hood to practice its profession.

It was my turn now, and it was all I could do to support the weight of the hood as I staggered reluctantly into the freezing water. "Be sure to give me plenty of air," I begged through chattering teeth. Then the water was around me, and the rubbery smell of the diving hood reminded me of an anaesthetic. I looked out on a swirl of opaque sediment through which I could see nothing. The hood had shut its eye and had gone deaf and dumb too, for the telephone was

short circuited. I ducked out and came up sputtering.

"There's something wrong with this thing, Barney. There's no air."

"There's plenty of air, Jane," Barney said. "You are just having a nervous reaction. It's a kind of claustrophobia."

Unconvinced, I tried it again. This time the water began to rise around my chin, and the weight of the hood seemed to bear down on me as if to bury me in the mud. I threw it off weakly and beat my way to the surface. Barney, fascinated by the performance of his creation, had forgotten to pump the air!

Vacation time had come and the hood was to get its salt water baptism in the tropical waters of the Florida Keys. It was 1935, and Key West was still essentially a Cuban town, closer to Havana than to Miami and connected to the Florida mainland only by a train. Despite its poverty, Key West was filled with color, for even the smallest of the unpainted gray frame houses was ablaze with the purple blossoms of bougainvillia. There was old world dignity in the shaded churches and a salty charm in the seaside docks where the fishing boats were moored.

It was New Year's Eve, and we could find no boatman to take us

and our malignant metal offspring to sea. Everyone was outside in the streets parading with musical instruments, shouting and singing in Spanish and shooting off fireworks. In Key West, in the thirties, there was just one place to go—Sloppy Joe's of Hemingway fame. There we struck up a conversation with a sponge fisherman named Mike. He was a solid, gristly man in his forties, dark-skinned and hairy. Over a Cuba libre he told us lurid tales of smuggling mahogany from South America, running rum from Cuba, and burning ships of Greek spongers from Tarpon Springs. Mike promised to take us to the Marquesas Keys on New Year's Day.

The next morning when we met Mike at the dock, he was red-eyed, unshaven, and looked worse than he had the night before. He wore sponge-stained yellow pants, a dirty skivvy shirt, and his naked feet were horny and gnarled. He must have been descended from the piratical wreckers who, in the early days of Key West, lured ships on the reefs with false lights and signals.

Mike had a 30-foot sponge boat with a little cabin and two bunks. We put the diving hood in the cockpit and piled our gear on board. A long pair of reins stretched from the wheel to the stern so that the boat could be steered from either side or from the rear as Mike looked in the water for sponges. Whenever he came to a likely spot, he threw a cupful of shark oil on the water. Instantly, the surface became as smooth and transparent as glass and, with a three-pronged hook mounted on the end of a twelve-foot pole, he snagged up the shiny black commercial sheep wool sponges that brought \$10 for a five-foot string.

As we headed west, we passed nameless little Keys, silver slivers of sand, marking the great sand-spit that projects nearly 200 miles from the coast of Florida into the Gulf of Mexico. The day was as bright as a fire opal. Iridescent

flying fish, borne on diaphanous wings, skimmed the surface and made flashing rainbows when they splashed into the bright blue waves.

It was late afternoon, too late to dive, when we anchored at the Marquesas Keys, one of the few atolls outside of the South Pacific. A ring of palm-studded coral reefs encircled a central lagoon. Fish from the open sea were swimming with the flooding tide into the channels and onto the mud flats. The fins of sharks cut the shallow water, and tails of bonefish wobbled as they grubbed, head down, for crabs and mollusks in the mud. Schools of silver mullet drifted by, and the dark backs and silver sides of tarpon rolled lazily in the channels. All of this shallow, sun-warmed flat was teeming with life and with food for the creatures that came in from the sea to feed.

We took a dinghy through the narrow channel that led to the central lagoon.

When night falls over the silent mangrove swamps, when the pelicans and the herons have gone to roost, when even the winds are at rest, the strange phosphorescent life of the sea awakens from its diurnal sleep. Until the black of night descends, the tiny bits of luminous plankton of which this life is made are as invisible as daylight stars. As we guided the dinghy across the flats, globs of fire drifted by in the shadowy water and dripped like star dust from our oars. We lit a gasoline lantern and its bright, white light illuminated the grassy banks beneath the surface.

Something hurtled across the surface and, trailing a phosphorescent wake, crashed into the side of the boat. Barney grabbed the net and dipped up a fiery object in the water. It was a needlefish, a miniature swordfish, eighteen inches long, which, blinded by our light, had run headlong into the boat and buried its needle-like bill in the planking.

Clouds were scudding across the moon, and there was the music of wavelets against the side of the boat when we went to bed. "Wind



▲ BARNEY helps Jane into a Jane Brown diving mask. After their first hazardous submersion in the near-freezing water of Lake Erie and some shallow excursions off Key West, the Crew moved into more complex equipment and began to look for other seas to conquer.

tomorrow," Mike said, and covered our loose gear with a big tarpaulin. We hoped the weather would not be too rough for diving.

The dawn was gray, and the sea was rough when we awoke. On the way to the reef, the boat pitched wildly, and we staggered about in a melee of photographic equipment and diving gear that rolled and clattered on the slippery deck.

We anchored over a coral reef. Mike held the hood. I adjusted the telephone. Barney ducked under the hood, and we lowered it slowly to the bottom. "Ouch!" I heard him yell through the telephone. "Get me out of here." And we pulled him up as fast as we could. The hood had maliciously deposited him onto a nest of prickly sea urchins. A dozen of their toxic porcupine quills were embedded in his bare legs. They burned like bee stings, and his leg was nearly paralyzed by the poison.

"Janie, it's all yours now," Barney said.

I had the same sensation as on

my first solo airplane flight, when, above the roar of the engine, I had heard the instructor say: "I'm getting out. It's all yours. Take it away."

I stood on the ladder. Barney and Mike lifted the hood and set it on my shoulders. I knew how Sinbad, the Sailor, felt, weighted down by the Old Man of The Sea. But in the water, the hood was light and comfortable.

"Good luck," Barney said, and waved reassuringly. The waves lapped the window and then disappeared in a haze of blue.

When you take your first salt water solo, your heart thumps, blood pounds in your head, your mouth is dry. The hood pushes you down slowly and irrevocably beneath the surface. There is no sound except the rhythmic hissing of the pump. The air smells thin and rubbery and breathing seems difficult. You are irresistibly compressed by an invisible force. Your ears are

full, ache, and are resonant to the sound of your breathing. You drift down, down . . .

It was not until I hit the bottom with a slow-motion bounce that my ears clicked, the feeling of pressure vanished, and the shadow of fear was gone. My senses cleared to a strange and beautiful world of half-lights and silence. It was a hushed cathedral where muted rays of light streamed through stained glass windows. Interlacing branches of a towering reef of staghorn coral formed gothic arches against the rippled ceiling of the surface. Purple sea fans and yellow sea feathers waved slowly to the rhythm of the surge. Schools of tiny jewel-like fish drifted back and forth in changing patterns through the interstices of coral. Half-floating, half-walking, I moved effortlessly across the sand. All sense of direction disappeared. Where was left or right, where even was straight ahead? The only sure direction was up,

where, 25 feet above, the magnified and reassuring bottom of the boat made a somber shadow on the silver of the surface. It was a timeless, soundless, weightless world where color was music, and the pastels of the reef were the leitmotifs of a symphonic dream.

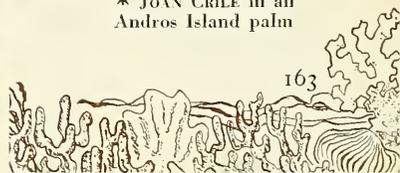
Like the low rumbling of an ominous chord, a shadow stirred in a dark opening of the reef. Imperceptibly, it grew larger and larger, materializing into the head of a huge black fish. It swam out at me, opening and closing a black mouth large enough to engulf my head.

Instinctively, I stepped backwards, lost my balance, and slipped down a five-foot sand bank. The hood came to life. It rose half off my head and lurched sideways. It blew out great blobs of air. Water rose to my mouth. In panic I tried to tilt the hood off my shoulders, but now it clung to me like Sinbad's Old Man. There was a leaden foot on the back of my neck, and it was

▼ DRIVING close-hauled toward the outer islands in the boat that had more stowaways than crew



▲ JOAN CRILE in an Andros Island palm



pressing me down into the sand. Finally, I fought my way free and started for the surface. A ropy arm clutched me around the neck, and I was dragged to the bottom by the dead weight of lead. I clawed at the rope, slipped out of the noose, and beat my way to the top with bursting lungs.

"It tried to drown me," I gasped.

When we tried to pull the hood up, it defied ups, for the rope, the hose, and the phone wires were hopelessly tangled in the branching coral. We pulled with all our might and broke off big pieces of coral but could not budge the hood, which was wedged under a bank. It was too deep for us to dive down and untangle the ropes. The more we worked, the more inextricably the lines got fouled. At last we had to cut them and leave our creation on the bottom, its glassy eye half buried in the white sand.

But the diving hood had not passed in vain. It had broken for us the barrier that separates ocean from air.

The ensuing years were to be full of underwater holidays in many lands. But it was not till April, 1946, that, with considerable experience behind us but still with much to learn, we set out in quest of the clearest water in the Northern Hemisphere—in the Bahamas.

Five thousand feet below us, the shallow water on the Great Bahama Bank was invisible except where shadows of clouds gave it density. This transparent water was the answer to our photographic prayer we told one another, and then the airplane landed on the bright, white coral of the airport.

The tourist season was over, and we could take our pick of accommodations at off-season rates. But the fishing boats were \$65.00 a day at the tourists' dock. We could find no economical way of getting to the reefs of Rose Island, and we started back to the hotel.

Suddenly, Barney's face brightened. A black, barefoot native was walking up the street singing and swinging a big fish, fresh and glistening from the sea.

"Where did you get that fish?" Barney asked him.

This was Bay Street in Nassau, but it might have been Queens Street in Oxford, and this barefoot native a Christ Church scholar fresh from a debate at the Oxford Union. His answer was in a cultured Oxford accent, modulated with a soft Bahamian drawl.

"I have a friend, sah, who has possession of a boat. May I be of service to you?"

"You bet you can," Barney said. "Just take us to your friend."

We followed him down the narrow street, thronging with the descendants of African slaves, past the Government House with its waving Union Jacks, past jet black constables erect and resplendent in white pith helmets and scarlet trimmed uniforms, and down a side street to the native docks. Here were dozens of out-island sailboats, each 25 to 30 feet long, broad of beam, and staunchly constructed of native pine and Madeira mahogany. These were the freighters of Bahamian commerce, plying among the 600-odd islands that together make a land area of over 4000 square miles.

Our guide took us to the first of the boats. It was overflowing with natives laughing and talking, and the blackest and jolliest of them all was the captain. We asked him if he would take us to Rose Island.

He confided that he had a most pressing engagement that afternoon, but "if de Lord spare us," he would be ready and proud to carry us on the morrow.

At eight o'clock sharp, we arrived on the dock. There was no laughter on the first boat; in fact, there were no people. The ebullient captain of yesterday sat mournfully hunched on the dock with his head in his hands. The canvas wings of his boat had been clipped. The pressing engagement of the afternoon before had been the Pony Races, and on them the captain had staked and lost his vessel's sail.

In the next boat, a slender, bright-faced Negro of 40, with

aquiline features and a close-cropped moustache, broke eagerly into the conversation, announcing himself as Captain Joseph Johnson. "I take you to Rose Island in two hours." A pound and ten—about five dollars—was the price. We climbed aboard his boat, the "Progress." He raised the sail, and we were off.

Between the island of New Providence, on which Nassau is built, and neighboring Hog Island is a deep channel about 300 yards wide, through which the tide runs strong. It was racing as we left the dock, and both tide and wind were dead against us. Native sailboats, because of the shallow reefs of the out-islands, have no centerboards, and their keels are small. Wonderful boats they are for sailing before the wind, but even without an adverse tide, their drift makes tacking difficult. Back and forth across the channel we tacked, and after two hours we were not a quarter of a mile from where we started. The tide was due to continue like this for several hours and then would be against us on our return. Certainly, the skipper had been aware of this problem but in Bahamian fashion had not had the heart to tell us. A customer in the boat, moreover, was worth a dozen ashore. He began to talk wistfully about his home on Andros Island.

"Where is Andros?" we asked him.

"Down to leeward," Joe said. "Tide and wind are both with us in dot direction and I take you dere in two hours."

That was what he had said about Rose Island, but Barney is an optimist and always seems to believe the things he wants to believe.

"We'll go with you, Joe," Barney said—and assured me that Joe looked old enough to have survived a number of these trips.

"I get you a house," the skipper said, "a beautiful house at Frsh Creek, on Andros. I take good care of everything you need, and I show you corals and creatures on de reefs. I even show you de Blue Hole."



▲ **READY TO DIVE.** To shield them from the tropical sun and give them protection against coral scratches, the entire family was fitted out in long black ballet tights and bright yellow jerseys. Leering faces made out of adhesive tape on their ballet bottoms gave the fishes something further to worry about

"The Blue Hole? What is the Blue Hole?" we asked.

"No one know what dot Blue Hole is," Joe told us. "It full of creatures. Biggest creatures you did ever see. Dot Blue Hole goes down to de bottom of de world. You won't want to go in dot Blue Hole when you see de creatures dere."

"What time will you be ready to leave?" Barney asked, and I could see the light of the Blue Hole in his eye.

"When de sun rise tomorrow," Joe said, "but now we go and see about de house." We ducked the boom as the boat came about, and Joe steered to the landing.

A few blocks from the dock Joe led us up a flight of stairs to an apartment marked "Clare's Photo

Studio." We were met by Randolph Clare, a tall, black gentleman, impeccably dressed in a dark suit, a white shirt, and a black bow tie. He greeted us in courtly fashion.

"I can assure you, sir, that you are heartily welcome to live in my house," he said to Barney. "I will have everything prepared for you on your arrival. The servants will be waiting. I will arrange all by radio."

By radio! The arrangements seemed so elaborate that we began to wonder if we could afford all this.

"How much will it cost?" we asked.

"Would ten dollars be too much?" Clare replied. "You can stay as long as you like."



▲ **JANE** and one of the children with a speared grouper. The inside of its mouth and gills was scarlet



▲ **EXPLORING** historic waters: Barney with a movie camera floating down over a cannon and the remnants of a wreck



We assented joyously and Clare, in a fine Spencerian hand, wrote out and signed a formal lease. The deal was concluded.

"What will we eat down there?" we asked Joe. "Do we have to bring our own food?"

"No, dey feed you unless you want fresh meat. If you do, we go to de market and get a turtle."

"Hawk's Beak is as good as de green," Joe told us later at the market. "Get one like dot," and he pointed to a lively-looking 25-pounder.

All food in the Bahamas is expensive, and the turtle cost as much as our house. We stowed it aboard, putting it belly up. In this immobile position, it could live for weeks if kept in the shade and doused occasionally with water. Turtles out of water do better on their backs because the weight of the heavy dorsal shell cannot interfere with breathing.

The docks were already awake next day as the first rays of sun slanted across the harbor. Captain Johnson was ready for us and in our honor he had hoisted an American flag—upside down. He corrected this error and then introduced us to the first mate, his uncle, Herman.

Uncle Herman's thin and feeble body and high, querulous voice placed his age late in the seventies.

He wore a tweed cap, the kind you expect to see with a pair of snappy plus-four knickers. Uncle Herman's pants were stained and faded khaki. He looked so old and weak that we hoped the tasks assigned him would not be too arduous.

The sail was raised, and with a fair wind and strong tide we sailed out past red and black flashing buoys, past the 66-foot lighthouse on Hog Island, and steered for the open sea. As the harbor dropped astern, our first surprise began to emerge from the hold. "Dis is my crew," Captain Joe explained. "Tom is not all dere in de brain, so Tom not pay attention to what he do. He won't hurt. He good—he do just what I say."

Tom climbed slowly out of the hold like a gorilla from a dark cave in the jungle of the Congo. He was shiny black, heavy muscled, and walked with a stoop, his abnormally long arms almost touching the deck. He wore an English striped shirt with no collar, and his once-white pants were held up by a piece of green string. His face was an underexposed photograph of an 8 ball with only the yellowish whites of his eyes showing. He looked at me with the fixed uninhibited stare of a child, never taking his eyes from me, and was not in the least embarrassed by my attempt to stare him down. He giggled,

jumped up and down, giggled again, and began to munch on a crust of bread.

"He won't do no harm," Joe said, "only he steal food. He was ward of de Government, but I sign for him and he work for me so long as I see dot he make no trouble. I responsible. I not let him out on de shore."

Just then there was a terrible commotion in the center of the deck where Uncle Herman was whacking at Tom with a stick of firewood. Tom had started to steal part of the lunch, and Uncle Herman, who was ship's cook as well as first mate, had caught him. Herman, who was in his second childhood, and Tom, who had never quite arrived at his first, were continually squabbling, belaboring one another, and throwing things about in fits of anger.

The hold of the vessel was like a magician's hat, and although we were under the impression that for a pound a day we had chartered the boat exclusively for our use, we soon found it was filled with stowaways. Out came a tall native woman, darkly shadowed beneath a wide-brimmed straw hat. She carried a nursing baby whose black tufts of hair were tied up with two shocking-pink bows. Next, came an eighteen-year-old boy with blood-shot eyes and heavy lids. He wore



◀ JANE, holding an underwater camera, digs a hole in the sand. The dozens of golden fish in the foreground had been attracted by the digging and came to search for worms

➤ JANE GLIDES over a gorgeous garden of sea fans, which are growing from the barrel of a cannon



a vest, but no shirt, and we wondered if he, like our first skipper, had lost it at the races. The boy lay down on the deck and slept most of the day. An old man with a stubbly gray beard tottered out, and a boy of twelve completed the inventory of human cargo. The boy in a sleeveless skivvy shirt sat cross-legged on the hot deck and chewed on a piece of sugar cane. He looked at us continuously and grinned whenever he caught our eye. The hand not occupied with sugar cane scratched intermittently at what must have been a serious itch. The hold the stowaways left was still by no means empty. It extended the full length of the 25-foot boat and was so filled with sacks of flour and sugar that it was hard to see where the people had hidden.

As Nassau sank beneath the horizon, I examined the sail of the "Progress." It was a patchwork of canvas, interwoven with little pieces of cloth that might have been old handkerchiefs, discarded blouses, or tattered pant legs. There were 93 distinct holes. We were out of sight of land now, with the trade wind pushing us on across the Tongue of the Ocean to Andros. We had not checked a map before we left and had no idea that we would be far at sea on the rolling blue surface of one of the deeps of the ocean. Thousand-fathom soundings have been made in this Tongue of the Ocean, and wind and wave can be wild and rough.

The boat heeled over with the breeze, and the tip of the boom brushed the surfaces of the big blue waves that rose beneath us. We felt as lonely as Columbus and, like him, did not know what lay ahead. Nor were we reassured when Captain Johnson said, "Tom, take de tiller." Tom jammed his cap on backwards, bounced into the air at the command and gleefully seized the tiller. He held it under his arm like a submachine gun while he wiggled his black toes over the cracked compass that lay loose before him on the deck.

In the center of the deck was a

sand-filled wooden box in which a fire smouldered. The flame was never allowed to die, and we wondered what fire underwriters would think of this floating tinder box exposed perpetually to a Vestal Virgin flame.

At noon, Uncle Herman put on more wood and began to make bread. He dipped a scoop of water from a barrel, poured it into the flour, and stirred it with a finger. The mixture was heated in a black bean pot and soon emerged, a round, hard bannock, toasted brown and appetizing enough, if you did not remember how it was made. The minute Uncle Herman put it on the deck, Tom stole a piece of it, and the air was filled with shouts and flying sticks.

A piece of fish was next put in the pot and over it was stuffed a thick layer of dirty rags that looked like old socks and underwear. It seemed that Uncle Herman was killing two birds with one stone, doing laundry and cooking at the same time. While the fish was being steamed, he reached in his pants pocket and pulled out a moist, mouldy piece of paper, shook its brown contents into a rusty tin can, added more of the greenish water from the barrel, and started to make coffee. If the strength of the coffee would not keep you awake, the thought of its ingredients certainly would.

The lunch was a great success, but I was not too unhappy when I put my heavy piece of bannock on the deck for a moment and Tom stole it.

We sailed most of the day on the open ocean without a sight of land. At last a flock of gulls flew over, greeted by Tom with cries of "Gullies, Gullies, see the Gullies!" Then the low cloud-capped, green outline of Andros Island rose from the sea. The blue waves of the deep water turned to green. Now the boat was filled with activity—everyone found something to do. The sleeping boy woke up and began to pump the bilge. Tom armed himself with a big oar and looked over the side expectantly. Uncle

Herman stowed away the cooking gear and dampened his fire. We could not understand the bustle and activity.

Then — bump — the keel struck the reef, the boat heeled over, the skipper let out the sheet, and the flapping sail took the boom out seaward and dunked it deep in the water. The boat tilted at a crazy angle. I clung to the mast, sure that we would capsiz on this lonely shark-infested reef, three miles from shore. Barney reached for our inflatable rubber life raft. No one else seemed worried. As we scraped and bumped along the bottom, the mother was changing her baby's pants and Uncle Herman was still stowing away his pans. Captain Johnson saw my horrified expression and said, "Don worry — we do dis all de time." Tom shoved the boat with the oar while the passengers all crowded over to the lee side and tilted the keel off the reef. In a moment we were over and sailing free again in the calm waters between reef and shore.

Ahead of us was Staniard Creek, a colony of 300 people, shaded with coconut palms and nestled behind a bright white strip of sandy beach. This was our first glimpse of the South Sea Islands of the Caribbean. "My home," said Captain Johnson, and pointed proudly to a little wooden house near the beach.

We left our passengers and freight at Staniard Creek, ferrying them ashore in the deep V-bottomed Bahamian dinghy that was always carried on the deck. Children and adults in gay colors came down to the beach, laughing and skipping rope. Tom wildly chased the girls and tried to jump rope with them. Joe climbed a palm tree, picked green coconuts, and carried them aboard the boat. We drank their cool sweet fluid as we sailed on down the Coast to our destination at Fresh Creek. Thirteen hours after we left Nassau Harbor on our "two-hour" journey, we sailed into the sheltered harbor of Fresh Creek.

* * *

Concluding experiences in this selection from the Griles' coming book will be published in the next issue of NATURAL HISTORY.—ED.



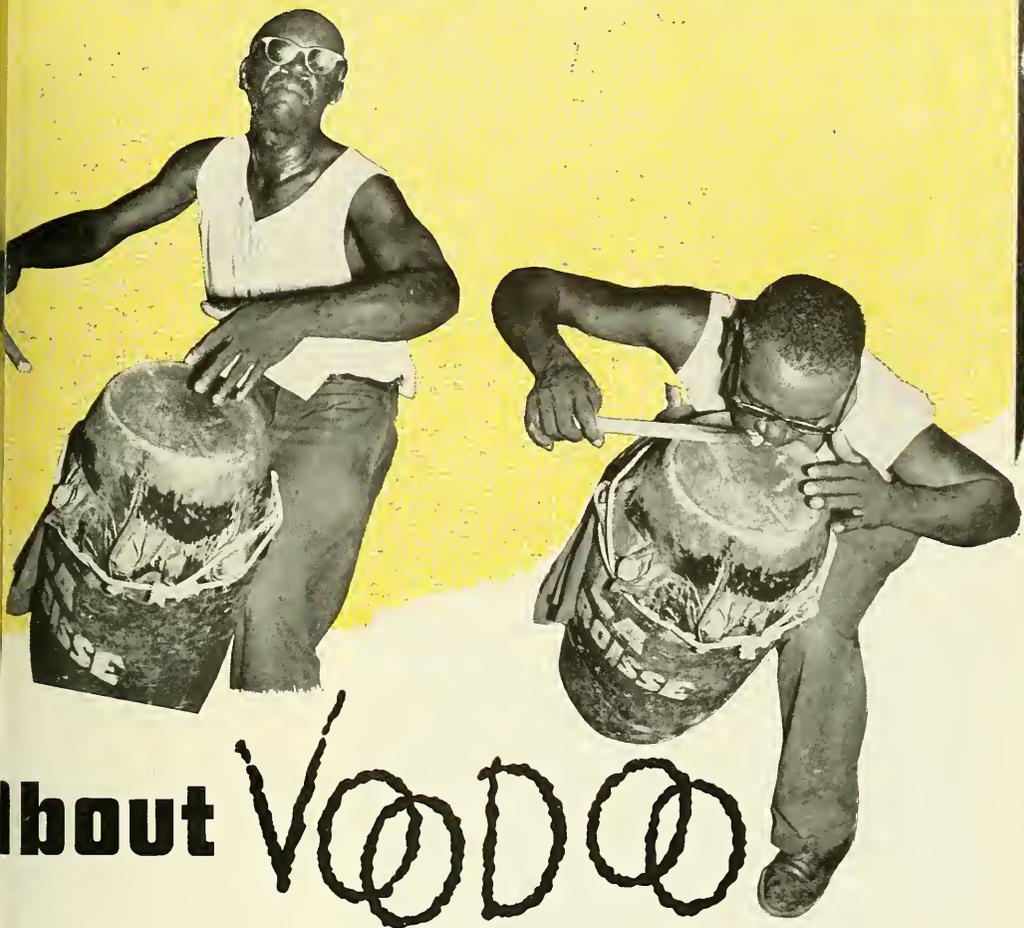
The Tru

▲ FOUR VIEWS of *rodou* drummer or *hountor* playing on the middle-sized drum. Note how at one point he places his chin on the head of the drum to alter its tone

WHEN darkness rapidly settles over Haiti and supplants the orange and purple of the sunset, the throbbing of drums in the country back of Port-au-Prince signifies only one thing to the newly arrived visitor—"Voodoo!" This is a natural supposition, since drums are an important and integral part of every real voodoo ceremony. And if the visitor has a lively imagination—particularly if he has read some of the recent stories about Haiti and "voodoo" by imaginative writers—there are no bounds to his fancy.

If the visitor happens to be driven past a small village or group of native huts (*cailles*) on a Satur-

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about

VOODOO

The "ceremonies" that visitors to Haiti read about in sensational stories and are taken to see are very different from the serious rites to which the average traveler is never admitted

By **ELMER H. LOUGHLIN***
Photography by the author and Steven Montez

day or Sunday night or on the eve of a holiday, or if his hotel is near a village, he may also hear a plaintive chorus of high-pitched female voices. This is all so novel and

seemingly unreal that he begins to picture the origin of these sounds in the chimera of a weird, fire-illuminated ceremony, with frenzied and savage dancing and singing as

violent as the flames that light up the participants in the rite.

He feels he is lucky when he is invited to one of these "voodoo ceremonies" by an obliging taxi

*Two and a half years of work in Haiti as a medical doctor directing a program to rid the island of yaws have given Dr. Loughlin entrée to remote sections not usually visited by outsiders.

He wishes to express his gratitude to

Dr. François Duvalier and M. Lorimer Denis for their notes on the voodoo ceremonies and for some of the historical background. Their help was generously given in connection with the native terminology, the ceremonial objects, and the

voodoo temple. It was through their assistance that it was possible to take the unprecedented series of unposed photographs of a Rada ceremony published for the first time here in NATURAL HISTORY Magazine.

Ed.



▲ A BAYSIDE VILLAGE at Miragoâne in Haiti



▲ DUGOUT CANOES plying back and forth to market at Mirebalais, on the Artibonite River

▼ A RAINY DAY near Léogane



driver. During the ride, his chauffeur will brief him about the occult rites and sacrifices he is shortly to witness.

When he arrives at the "ceremony," he is usually told that he came too late to see the sacrifice of the animals, which he may be told included a bull, goat, or pig. If only he would remain in Haiti for a while longer, he might witness such a ceremony.

Swallowing his initial disappointment, he enters a large hut or enclosure provided with a thatched roof and a dirt floor. He is impressed by the reverberations of the drums, the clanging of iron, the mooring of the bamboo *vache*, the clatter of the *chacha* rattles, and the chanting of Creole songs, interrupted periodically by the master of ceremonies blowing a policeman's whistle and ringing a small bell. He finds himself in a milling group of strangers who apparently accept him and is fascinated by the movements of some of the younger participants, especially the women. They are shuffling about the enclosure in a seemingly aimless manner with vacuous stares on their perspiring faces. "This," he says to himself, "is it!"

If he is not completely convinced and asks the taxi driver whether this is really voodoo, his escort usually prefers to move away to consult with some of the bystanders. Presently he returns with the whispered and almost secret information that this is voodoo. Sometimes a group of visitors, bent upon seeing a voodoo ceremony, are permitted to witness the entire "ritual," including the tracing of the cabalistic symbols on the ground. Of course, this is the result of a prearrangement between the taxi driver and the "priestess," commonly referred to in stories as the "*mamaloï*."

After watching the dances and listening to the singing for an hour or so and becoming wearied by their apparent similarity, the visitor may become quite sophisticated about the entire subject and



▲ THE ALTAR of Erzulie, showing the intermixture of pagan and Christian beliefs. The symbols on the wall are lithographs of the Virgin Mary. The bottles wrapped with ribbon contain holy water. The small bottle in front contains perfume for the *vodou* deity. Note the vigil light in the center of the altar and the ceremonial drums.



▲ ALTAR of the God of War, Agoum Badagri. The sacred articles include flags of the deity, a machete, and other articles. The earthenware basin is to collect the blood of sacrificed animals.



► ALTAR of the Protector of the Cemetery, Baron La Croix. The offerings include rum, soft drinks, bread, and coins.

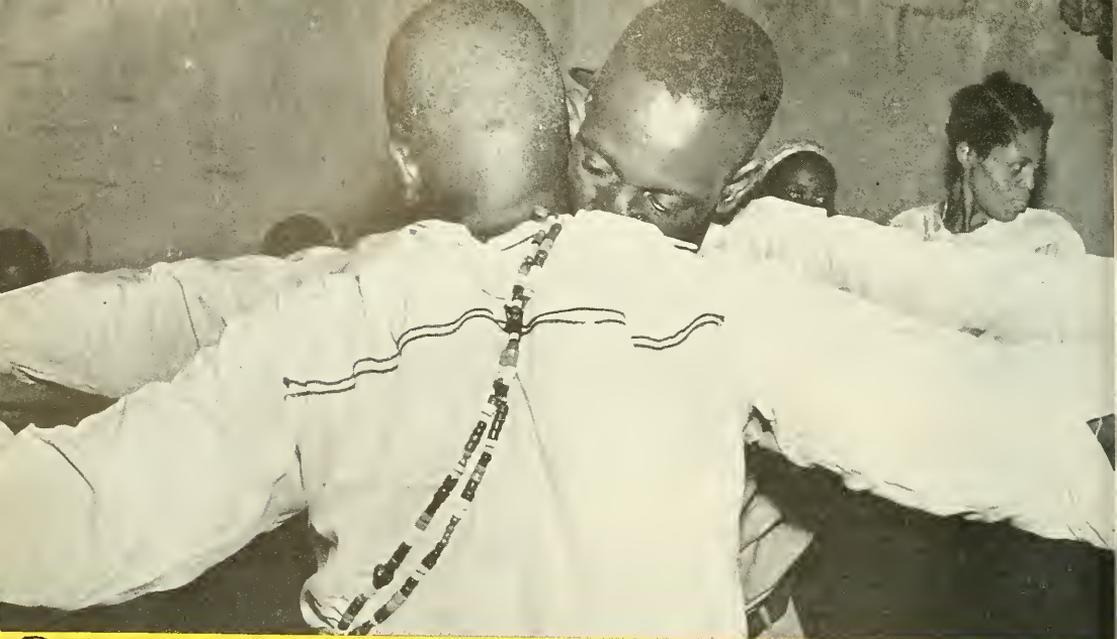
▼ THE HIGH PRIEST tracing the mystical signs in cormmeal with the help of a male assistant. The design shows to which deity the service is dedicated, in this case to the *vodou* equivalent of St. Patrick, whose snakes it depicts. Partly out of sight in foreground is the ship of the God of the Sea.

dismiss it as something inane. On the other hand, his imagination may have been stimulated by stories about "voodoo" in Haiti or by the taxi driver's briefing, which may have included a guarded remark about recently reported sacrifices of children. He may then believe that he has been witnessing the real Haitian voodoo. When he returns from Haiti and tells of his experience, he may try to surpass even the most imaginative story writers.

As a matter of fact, the "booming drums" and the dancing and singing in these villages are nothing more than the Saturday or Sunday night folk dances, known as *bamboches*. They may be compared with our square dances and certain European folk dances. The *bamboche* is the usual week-end relaxation of the Haitian peasant and provides him with the opportunity to get together with his neighbors and relatives at what is merely a social gathering. The taxi driver who has taken the visitors to the "voodoo ceremony," as well as the "mamaloi" who conducted it, usually profit from the naïveté of the visitors.

It can be definitely stated that visitors in Haiti do not witness voodoo ceremonies either by chance





▲ HERE THE PRIEST (*back to camera*) and his assistant are beginning the dance of the Rada rite to summon the spirits to the ceremony

▼ THE PRIEST is holding in his right hand the beaded rattle and the bell, and his assistant is about to become possessed by the deity

or intention and that the *bamboches* and the supposed "voodoo" ceremonies are never held in or near the real voodoo temple, or *houffort*.

The term "voodoo," or more correctly, *vodou*, is of African origin and was used by the natives of Dahomey to indicate any deity. Some of the more imaginative writers have attempted to derive the word *vodou* from *veau d'or*, or "golden calf." They trace its origin to the golden calf fashioned by Moses' brother Aaron in the likeness of the Egyptian Apis and worshipped by sacrifices, wild dancing, and shouting. It is extremely doubtful, however, that the Dahomeans were aware of the *veau d'or*.

Vodou is not concerned with the practice of black magic, sorcery, or witchcraft, or with any of the devil worshiping rites frequently ascribed to it. The *zombis*, the living dead or soulless automatons, are definite figments of superstitious peasants and story writers. There are no human sacrifices in the rites of the



vodou ceremonies, and it is unfortunate that these sensational features have been made notorious by the writers of fiction.

What, therefore, is *vodou*? *Vodou* is a religion that is practiced

and believed in by the majority of Haitian peasants and is reflected in the many intimate aspects of their daily life. *Vodou* can be traced to the tribal cults of Africa, through the eighteenth century slaves who

contributed to today's Haitian peasant population. According to the concepts of the Haitian peasant, *vodou* does not supplant his Christian religion, which is usually Roman Catholic. Rather, it supplements it, since it possesses the original common factor in Haitian peasant tradition. *Vodou* is the familiar daily religion of many of these people, whereas the Christian religion is the one to be practiced specially on Sundays, at baptisms, marriages, and deaths, when there is a church and a priest.

The *vodou* religion provides an invisible bond between individuals. It serves as well as a linkage be-

tween the Haitian peasant of today and his African forebears. The ceremonies were at first essentially religious and were practiced according to tribal regulations by the slaves imported from Africa, with considerable influence from the rites of the Dahomeans. The cult was able to supply the stimulus for coalition of a heterogeneous people from many African nations, including the Dahomeans, Aradas, Nagos, Congos, Senegalese, Ibos, Mandingues, Canas, Fans, and Caplaous, and it gave strength to their effort to throw off the oppression of slavery. It was first used in Haiti as a manifestation of this bond on

August 14, 1791, when in a *vodou* ceremony at Bois Caiman, the high priest Boukman organized the revolt of the slaves against their French masters. Subsequently, because of the initial success of this revolt, *vodou* became synonymous with the desire of all Haitians to become and remain free.

Vodou has continued essentially as a primitive African cult, worshipping inanimate as well as animate things, along with certain deities and the spirits of deceased persons and of powerful ancestors, to whom are allotted positions in the pantheon according to their accepted supernatural powers. *Vodou*

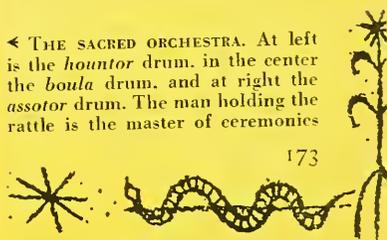


THE PRIEST dances with the priest-ess. The priest transfers the beaded rattle to her.



▲ THE *vodou* PRIESTESS, with the beaded rattle in her hand, twirls a female worshiper to bring about possession by a spirit. The cornmeal on her lips is from kissing the mystical design on the floor. On the wall are seen pictures of the *vodou* counterparts of St. Anthony and St. James the Greater

◀ THE SACRED ORCHESTRA. At left is the *hountor* drum, in the center the *boula* drum, and at right the *assotor* drum. The man holding the rattle is the master of ceremonies





▲ HERE THE FEMALE assistant is bearing the flag of the deity and paying homage to the vodou priest, who is possessed by the vodou equivalent of St. Patrick. Other participants and worshippers chant songs



SCENES in the Salute to the Flag, with the ritual of the *sabre*. Female assistants are bearing flags, and the worshippers are chanting songs of the deity



has also assimilated many features of the Roman Catholic religion, which was prescribed for the slaves by their French masters and is today the national religion. There is the recognition of the God as the Supreme Being, the Creator of man and of the world. In the opening ceremonies, the prayers are Catholic and are frequently accompanied by the sign of the cross. Although there are *vodou* deities, or *loas*, that have originated from Africa (Guinea) or have been created in Haiti, many of these have their Christian counterparts. Some are: Legba and St. Anthony; Erzulie and the Virgin Mary; Damballa and St. Patrick or St. Peter; and Ogoun Feraille or Ogoun (Hogou) Badagri, the god of war, and St. James the Greater.

There are two main types of rites, Rada and Petro, which are never mixed in a single service. The manner in which they may have evolved separately is suggested by the distribution of the deities. The Rada rites usually honor the African deities, which are honored also in certain localities in the Congo. The Petro rites usually honor the deities of Haitian or local creation. When Rada or African deities are included in the Petro pantheon, as they admittedly are, they may change remarkably in character. For example, Erzulie is portrayed in the Rada pantheon as a gentle, timid, and at times a sorrowful woman, as shown in color lithographs of the Mater Dolorosa. When she is in the Petro pantheon and is known as Erzulie Gé-rouge (Red Eye), she becomes boisterous, rough, and at times unmanageable. The Petro rite is believed to have been originated in Petit-Goâve, Haiti, by a famous and powerful *houngan*, Don Pedro.

The *vodou* worship of the deities, or *loas*, calls for temples containing altars, on which are placed the

◀ THE HIGH PRIEST NOW salutes the arrival of the deity with the beaded rattle and the bell

symbols and offerings to the *loas*. Unfortunately, there is no written record of the ceremonies. Because of this lack of orthodoxy, the rites have changed through the generations and differ considerably in the various sections of Haiti. There are broad similarities, however, that will make it possible to describe the worship in a general way and to illustrate the rituals of what is called the Rada rite in the accompanying photographs, made during an Easter service.

After reading some of the lurid and fanciful stories of Haitian voodoo, with their demon-worshipping rites and mad orgies, I went to my first ceremony with no small measure of apprehension. I was, at the same time, excited by the anticipation of seeing the weird rites of this supposedly savage cult. My fears were quelled when I saw the people who were present in the *vodou* temple and who were shortly to participate in the ceremony. I recognized several whom I had previously seen engaged in their everyday work, and they appeared to be no different at this time. As an invited guest, I was graciously received by my hosts, who guided me about the temple and eagerly exhibited the altars, the offerings, and the implements for the ceremonies. I was disillusioned when the wild orgiastic rites so vividly pictured in tales of voodoo did not take place and when I discovered that the services were essentially religious and were not, as some writers have misrepresented them, the occasion for diabolism or for mass eroticism.

Although bewildered by what I had previously read about voodoo rites, the interpretation of the songs, dances, and rituals given to me by my Haitian mentors became the key to an understanding of the ceremonies. The service was conducted ostensibly with solemnity and in planned sequence. The worshippers, whose faces were sober and reverential, were well versed in their roles and executed them carefully. I was deeply impressed

► THE PRIEST (left), possessed by the counterpart of St. Patrick, dances with an assistant holding a bottle of holy water

by the evident sincerity of those who were participating in the rites and by the patently bona-fide emotional and physical responses manifested by those who became possessed by the *loas*. The observer at a *vodou* ceremony would have to be entirely unresponsive and unimpressible not to be a little affected by the dynamic rhythms of the sacred drums, by the African and Haitian songs chanted by the sacred chorus, by the symbolic dances performed by the worshipers, and by the rituals themselves.

The *vodou* temple, a sand and cement hut with a thatched or corrugated iron roof, is known as the *hounfort*. This temple consists of an antechamber, or peristyle, in the center of which is a wood pole (*poteau legba*) and the *hounfort* proper, in which are found cement altars (*pes*), dedicated to the *loas*. The altars are usually separated by cloth curtains. On the walls of the *hounfort* or on the altar itself are seen the flags of the *loas*, as well as the national colors. Various sacred articles are placed on the altar, while the sacrificial animals are put in front of it.

The sacred articles on the altar include the ceremonial drums, the machete or saber, the flags of the *loas*, a cross or crucifix, a vigil light, the beaded rattle (*açon*), the bell (*clochette*), an earthenware jug (*govi*), an egg, candles, and a bottle of *loa* perfume. Most of these are used in the rituals of the ceremony.

Representations and emblems of the *loas* are usually painted on the walls of the *hounfort* or above the altar, and symbolic objects are placed on the altar. Legba is pictured as an old man with tattered clothing. Ogun Feraille or Badagri is a general in military uniform, occasionally on horseback. Erzulie is identified as the Virgin Mary in



▼ HERE THE PRIEST dances over the symbol of the deity. The Master of Ceremonies (right) is possessed by a deity and is unable to direct the ceremonies at this point. His rattle is held by a worshiper at right





▲ THE PRIEST sprinkling perfume in the direction of the four cardinal points. The falling drops can be seen in mid-air. The female assistant, serving as *Reine Drapeaux* (Flag Queen), holds the flag over his head



▲ THE PRIESTESS and priest, followed by the Flag Queen, saluting the sacred orchestra. Note the positions of the priest's hands

one of her many representations as depicted in colored lithographs. Damballa (Oueddo) is represented by a drawing of a serpent. Aida Oueddo, his wife, is a rainbow. Agoue Arroyo, the god of the sea, is symbolized by a ship. Baron LaCroix (or Baron Samedi) who is the protector of the cemetery, takes the form of a cross protruding from a "grave" and inscribed with skull and crossbones and his name. The several *Guèdés*, including *Guèdè Nibo*, are represented by a cross on which is hung a black hat, or by a peasant's straw hat and the mountain peasant's shoulder bag (*macoute*). The *Maitresses d'Veau* are thought of as beautiful mulatto women with long hair who bathe nude at stream sources and speak French.

The sacrificial animals are usually cocks, although a male pig or goat, and at times a bull, may be

used in certain rites. The meat of the sacrificed animals is cooked and eaten by the worshipers after a small portion is offered to and "accepted" by the *loas*. The offerings are also placed on the *pe* and include the things that the *loa* likes, such as bottles of rum, soft drinks, bread, and cooked plantains and yams.

Each of the *loas* has a special color, and these colors are used in the rituals of the ceremony, depending upon the *loa* being honored. In various sections of Haiti, the *loas* have different colors, and the rituals may also vary. Red is preferred by Ogoun (Feraïlle or Badagri) for his flags and sacrificial animals. Damballa's color is either green or white for the flags and white for the animals. The *Guèdés'* preference is for black; and Erzulie, Agoue Arroyo, and the *Maitresses* fancy white for their ceremonies.



When robes are worn by the officiator, particularly the *mambo*, they are of the color prescribed by the *loa*.

The *houngan* is the high priest in the sacerdotal hierarchy of a district or community, except in some sections where this position is occupied by a priestess known as the *mambo*. If the *houngan* officiates at Rada as well as Petro rites, he is said to serve with both hands. If he acts as a family adviser as well



THE WORSHIPER passing a series of mental, emotional physical disturbances possession by Erzulie, who died with the Virgin Mary



THE TRUTH ABOUT VODOO

as a *vodou* priest, he is sometimes referred to as *Papa Loa*. He is usually aided in the ceremonies by a male assistant (*hounguenicon*) and female assistants (*hounsis*). The *hounguenicon* leads the chorus in songs to the arriving *loas* and may serve as a drummer (*hountor*). Finally, there is the *LaPlace*, who acts as master of ceremonies.

The *vodou* ceremony usually consists of two parts. (1) The service is private and can only be attended by the family, the high priest, the priestess, the assistants, and a few specially invited guests. (2) The dance is not private and is attended by friends and neighbors. Since the service is completely religious, it is conducted by the high priest or priestess as a series of rituals, called *Service Loas*. Some of these are intended to honor the deities or *loas* to whom the family is grateful, others to propitiate *loas* who, they believe, are harassing them. Still another purpose is to renounce the worship to certain *loas*, good or bad, and to request, after a suitable sacrifice, that they depart.

Following the death of a person or on the anniversary of his death, a memorial dinner is held—a so-called *Manger les Morts* or *Manger les Ames*. There are animal sacrifices in connection with this, and rituals which include last prayers (*dernieres prières*), removal of the soul from under the water (*ouété mort en bas d'Veau*), and the release of the imprisoned soul (*casse canari* or *loa nan canari*). An extremely restricted service is seen in the rituals for the transfer of the *loa* from a recently deceased head of the family to another member of the family designated by the *loa*. This transfer carries with it the authority and the *connaissance*, or know-how, for invoking the *loa*.

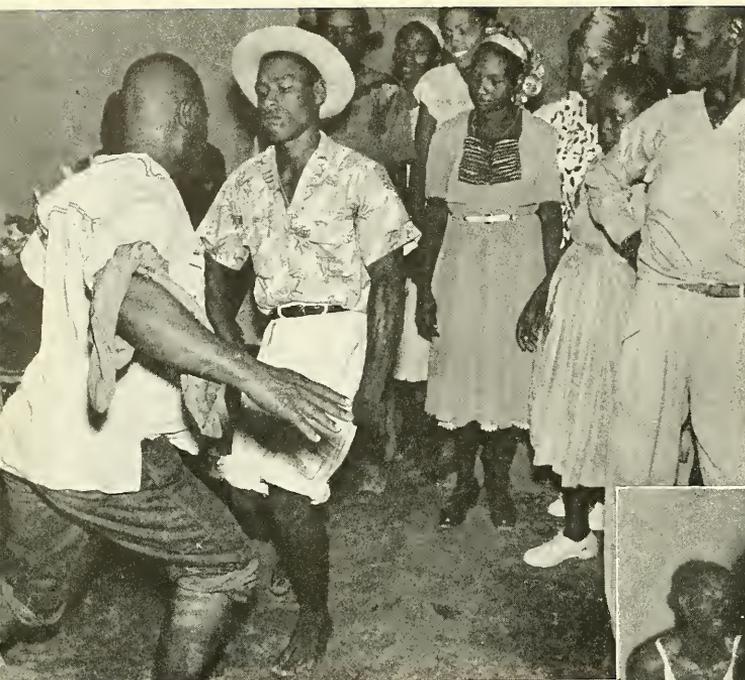
➤ THE PRIEST, having received the earthenware jug of water from the Flag Queen, drinks from it in the way that the deity is believed to do

The *Manger Marassa*, dinner in honor of the twins, is in most sections of the country a less important ceremony than any of the above-mentioned. These services are intended to honor twin deities, usually represented by male and female figurines.

Although families may request a service for any of the aforesaid purposes, other ceremonies regularly correspond to the holidays of the Catholic Church (particularly Christmas, Easter, and All Saints ceremonies) and to the harvests. Any of these ceremonies may be dedicated to either Rada or Petro deities. When a *loa* of the other rite appears in the possession of a worshiper, the *loa* is asked to leave. If this request is not heeded, the possessed is led away from the service to emerge from his unwelcome possession or is sent home.

Before starting the actual service, there is a preliminary recitation of prayers, usually Catholic, and the chanting of hymns, accompanied by waving of flags. This initial ritual is called the *action de grâce*, and is followed by an invocation to the most revered of the deities, Legba: "*Papa Legba, ouvri barié pou nou.*" The high priest then traces the cabalistic *vèvè*, indicat-





▲ THE PRIEST dancing with a male worshiper to bring about possession by the spirit. In this photograph, the female assistant has apparently emerged from possession



▲ AS THE SACRED DRUMS beat out their ceaseless cadence, the dance grows more intense

◀ THE SCARF that was on the priest's arm in the previous photograph has now been transferred to that of the male worshiper, and he is possessed of the spirit

ing by symbols to which deities the service is being dedicated. The *Salute to the Flag* follows, and it is one of the most important rituals. It actually is a welcome to the arriving *loa* and is conducted with the machete and flags of the *loa*. On occasion, it may be used to greet an extremely powerful priest or priestess.

During the service, the sacred orchestra sets up the rhythm for the songs of the *loas*. It is usually made up of three drums, the largest of which is called the *manman*, or *assotor*; the second, the *hountor*; and the smallest, the *boula*. In addition, there is the iron *ogan*, an

iron implement struck by another piece to mark the rhythm, and the *tia-tia* or *maraca* nonbeaded rattle. The chanting of the songs, which are usually either Rada or Petro, is accompanied by dances to the *loas*. The drums used in the service are either Rada or Petro depending on the rite. The arrival of each *loa* is indicated by the behavior of the worshippers, who appear to become possessed. Then the song of the particular *loa* is chanted three times.

Possession by the *loa* is the culmination of the ceremony, and it is to this objective that the rituals are directed. When certain worshippers seem to be possessed or "ridden," it is proof that the deities or *loas* have deigned to come to the ceremony by possessing or "riding" certain worshippers. Although many theories have been offered to explain the nature of these possessions, most of them are too complicated or vague to repeat here. From my own personal observations, it would seem that the worshiper must be in a condition of mental and emotional receptiveness or susceptibility to the occurrence of possession, and that as a consequence of mental, emotional, and physical transformations he gives the appearance of having allowed the "spirit" of the *loa* to supplant his own and to have substituted submission for self-restraint. Denis and Duvalier depict in Creole words the pattern of this possession: *Loa monté li* (The *loa* rides him); *loa dansé lan tête-li* (the *loa* is dancing in his head); *maitre tête-li monté li* (the master of his head is riding him).

The *voodoo* service is an exceptionally serious ceremony, whereas the dance that follows the service becomes more festive with the arrival of friends and neighbors. Although spirituous liquor may be offered to guests as well as to the more important members of the family, neither the service nor the dance is the drunken and frenzied orgy that some authors of fiction about Haiti and "voodoo" would have their readers believe.



▲ PEASANTS doing their laundry and bathing in the river at Pilate, in Haiti



▲ WARES BEING DISPLAYED outside the market at Saint-Michel-du-Sud



Philip D. Cendreau photo

▲ BROOKS ARE the only ceaseless music of nature, and they have inspired poets and practical men alike. They are also the capillaries of the earth's great circulatory system

Books in running brooks

Each stream measures the way man has lived with nature
and gives warning while the landscape may yet be saved from abuse

By WILLIAM A. BREYFOGLE

ON a day to be spent out of doors, a brook makes a good companion and a fascinating study. Brooks have been friends and associates of men as long as men have been on earth, and not only of men but of all living things. They are living things themselves, if birth and growth, change and

vital function can make them so.

When all the laws that govern the working of physical matter have been explored, when rainfall, topography, climate and vegetation have been thoroughly discussed, something about a brook is still unexplained. Dissect a bird in utmost detail and you have not ac-

counted for its song. The brook has a song, too, to make good its claim to be something more than just an intricate mechanism. Machines may whirl, but they do not sing.

A brook is running water in its earliest youth, just after it breaks from the earth. It is worth a scramble over rough ground and

through tangled undergrowth to come at last to the pool, no bigger than a water pail, constantly astir with an impulse from the darkness beneath. Far away though it is, the mouth of the Mississippi or the St. Lawrence is implicit in this place. The stream flowing out of the pool is on its way to New Orleans or Tadoussac.

An inspection of its brooks will tell you much about the general health of a region.

They are the little veins in the earth's great circulatory system. In health, they carry nutrients for a host of plants and animals. In illness, their pollution can warn us that a landscape is being ruined while there is yet time to save it.

A steady current and clear water mean that the woodlands have escaped reckless cutting and that the topsoil formed over thousands of years has stayed in place, instead of being swept away like a spendthrift's money. The fishing will be better in this brook, animal and plant life in the woods will be more abundant, and the farms near by will be more prosperous, better places to live. There is no sadder sight in nature, and none more alarming, than a watercourse shrunk to the merest trickle in the heat of summer, swollen to a muddy torrent by the surface runoff of spring. More ominously than any statistics, it proclaims a culture in decline.

One thing to be learned while loitering along a brook is that natural beauty is a matter of the first importance, not only to the artist but to the economist. A swamp with a profusion of pitcher plants and lady's-slippers, perhaps the rare little ram's-head; or a patch of hardwood cover where a fox still rolls in the sun in front of his earth—these are, quite literally, like money in the bank. They mean that a district has been settled and cultivated without being despoiled, that the people here are living within their income and leaving the truest kind of capital untouched. There is nothing sentimental about an interest in the preservation of wild flowers. They

are of just as vital concern to a banker as to a botanist.

The brook exists not as a thing in itself but as a part of a highly complex system of symbiosis, which means "living together." In animate nature, there is no such thing as isolationism. Each individual life touches many others and at more than one point. The function of the brook is to carry off rainfall. But, besides that, it provides a home for trout and caddis worms and water cress. It gives drink to the farmer's cattle in a pasture below the woods, and it turns the miller's wheel, just as it once filled the beaver's pond. What must always be remembered is that the system of which the brook is a voice and a symbol is in such close and delicate balance that no part of it may be rudely changed without disrupting the whole. The trout in its pool and the wild orchid in the woods are at the mercy of the lumberman, or of the farmer, or the careless hunter who does not put out his fire. When the trout and the orchid disappear, the beauty and fertility of a whole district go with them.

Travelers along the modern highway that was once the old National Road, from Cumberland over the mountains to Wheeling and on across Ohio, sometimes smile at the disproportionate size of stone bridges built nearly a century and a half ago. But the bridges were not too big when they were put there; it is the streams that have shrunk as the great woods were cut down without any foresight in the scramble for land. Those old bridges are nothing to smile at.

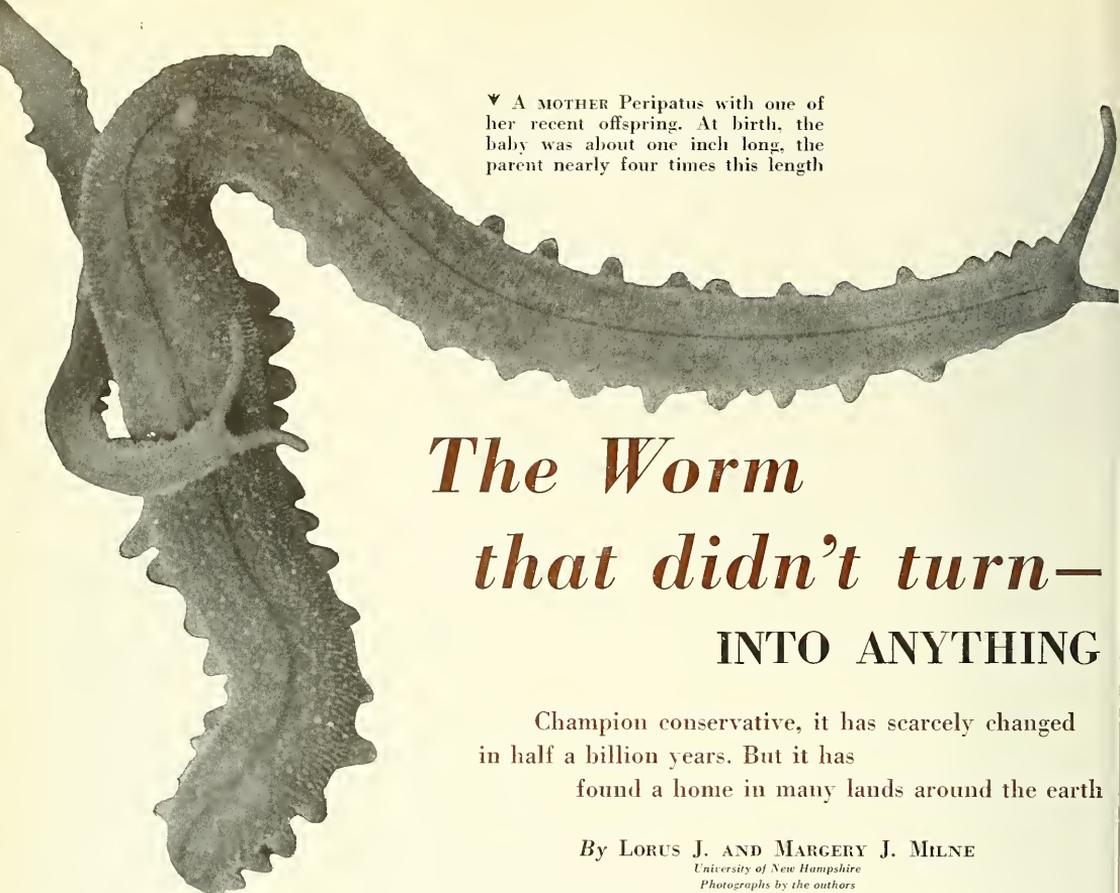
It is a mistake to make a distinction between the world of nature and the world of mankind. Man's world is only a part of the larger one, and its vital processes are not suspended because he has settled to agriculture and built cities. On the contrary, his well-being still depends upon those processes, whether he lives along a country road or in an apartment-hotel in New York. He may try to shrug off what is happening on the hillsides

or the riversides, but both are nearer than he thinks. The brooks still run for him, though he may seldom catch even a glimpse of them now.

But it is a pity if he does not. For, quite apart from their importance in the scheme of things, there is nothing more beautiful than a brook in being. Much that it has to say may be apprehended rather than understood—the pattern of water in sunny shallows and the way willows lean out over a pool, a muskrat making his purposeful way upstream, a kingfisher diving. Where the stream flows through woods, crows have an officious way of policing its course, crying aloud to all whom it may concern that something is moving down there. On a quiet stretch, the water striders make nothing of what is no miracle to them. Much higher than the noisy crows, a hawk soars, ready to plummet earthward when his prey slips down to drink. The swirl in the water just ahead may be a mink at his fishing.

A brook is a busy place, not only in its own primary work but in the variety of life it supports or attracts. And its beauty is informed with all this vitality, which is perhaps what gives it universal appeal. It is very much a part of the world that all living things inhabit, and a most sensitive indicator of the state of health of its own part of that world.

It used to be said that true intellectual curiosity could begin anywhere and find one subject leading into another until the whole realm of knowledge and understanding had been included. Certainly, given leisure to explore all its aspects, this is true of a brook, and it may be only another way of saying that the world is one world, not divided into compartments but to be understood, if at all, as a whole. The study may be as profitable as we wish to make it and as delightful as an afternoon along a brook's course. Surely it is true that there is hope for every people so long as they have not let their brooks run dry.



▼ A MOTHER *Peripatus* with one of her recent offspring. At birth, the baby was about one inch long, the parent nearly four times this length

The Worm that didn't turn— INTO ANYTHING

Champion conservative, it has scarcely changed in half a billion years. But it has found a home in many lands around the earth

By LORUS J. AND MARGERY J. MILNE

*University of New Hampshire
Photographs by the authors*

MOST biologists hear of and read about *Peripatus* (pronounced pe-rip-a-tus). But few of them ever have the thrill of meeting this "missing link" face to face. By traveling 2000 miles each way to the American tropics and spending weeks in careful searching, we achieved this scientific satisfaction.

The event stands out in our minds along with the first sight of an iridescent blue *Morpho* butterfly flitting lazily along a jungle trail, our first glimpse of a brilliant-billed toucan undulating across a clearing to join its calling mate, and our first sudden encounter with a band of monkeys—free and wild in the forest canopy overhead. Finding *Peripatus* was the climax of an exhausting quest. We found it in a

well-settled pile of stones around the base of a tall coconut palm on a steep hillside. And our discovery was made behind a little white church in the thatched village of El Cermenno—in the "interior" of Panama.

Gradually we'll forget the number of soggy, rotting logs we tore into shreds, the bushels of brown fallen leaves we peered under, the pounds of topsoil and forest litter we shook through a screen, the hundreds of old palm frond bases we cut with a machete—all in search of *Peripatus*. Such are the favorite hiding places of these animals. The only problem is to find a colony. We located countless millipedes of a dozen kinds, an amazing assortment of centipedes, great

numbers of pill bugs, and various small ground beetles.

We inquired of everyone we met: "Do you know where there are any live *Peripatus*?" Native Panamanians thought we were on the trail of a new medicine as we hunted for a brown worm—*uno gusano moreno*—a peculiar creature without any common name. It was not a caterpillar or an earthworm or a beetle grub. It had legs all along each side of its body, and it would spit a sticky saliva that was harmless. No, it was not a centipede. We didn't want millipedes, either. Only *Peripatus* would do.

Finally we had to rely on searching localities where others had been successful. The Orsini orchard near La Campana was such a site.



▲ A VIEW of the laboratory area on the east side of Barro Colorado Island in the Canal Zone. It was here that the species of *Peripatus* described in this article was studied

But in the ten years since previous collections had been made there, the Orsini family had tidied their orchard. No longer were logs and stones scattered under the trees. The logs had been burned, and no doubt the ancestors of the friendly chickens that followed us around as we hunted in the rain were responsible for eating *Peripatus* after the cleanup operation. Similarly at El Cerneno; the place to look was in frond bases of five-year-old palms. But we could find no five-year-olds. Palms that had yielded *Peripatus* before were now fifteen years of age, and leaf bases were all far beyond reach.

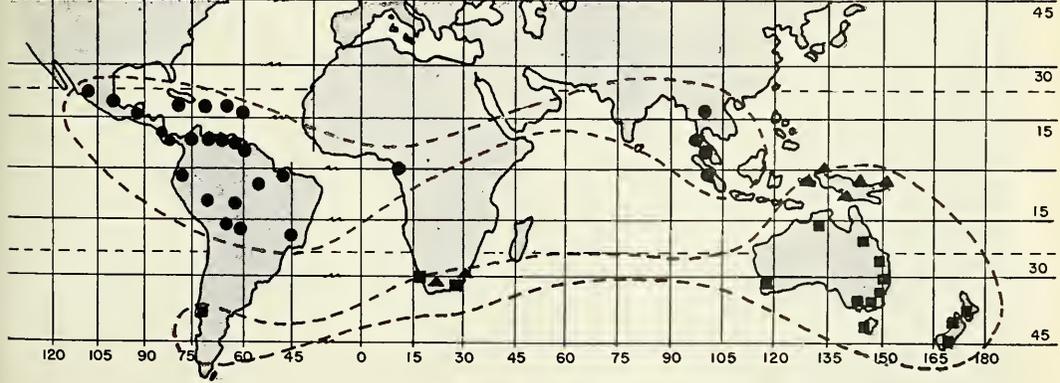
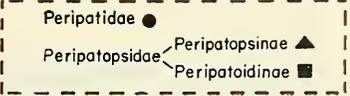
After eventually locating the first supply of live *Peripatus*, we looked

for them in other places. At the historic site of *Panama la Vieje* (Old Panama, destroyed in 1671 by the pirate Morgan) we obtained from the policeman on guard reluctant permission to turn over stones that had been moldering for years. It was risky work, for sizable scorpions and formidable centipedes had made these ruins their home. Somehow we avoided stinging tails and biting jaws—and found more *Peripatus*. The backyard of a friend in the fashionable suburb of Bella Vista, just outside Panama City, yielded additional specimens. The owners had never realized what remarkable denizens lived on their property. Even the people we had asked first about this



▲ FROM their screened cabin in the laboratory clearing, the authors set out to explore the many trails through the jungle, looking for *Peripatus*

▼ THE TWO FAMILIES of *Peripatus* embrace 80-odd different species, widely distributed in the Tropics. Not a single specimen has been found north of the Tropic of Cancer. They apparently spread via land bridges, not by water



famous animal began to bring us the right thing. The problem of caring for them arose.

Since every specimen we uncovered sought distractedly for a dark hole into which it could creep, we kept inquiring, "What does a *Peripatus* eat?" The reference books we had available described at great length the ways in which the animal's anatomy resembled that of such annelid worms as night crawlers and clamworms, and the peculiarities of structure to be found elsewhere only among such arthropods as millipedes and insects. But none of them told much about *live* *Peripatus*. One mentioned that they were believed to be carnivorous, catching insects among the forest litter, possibly by spitting slime on them.

At first the most important consideration in providing captive *Peripatus* with suitable living quarters seemed to be not food but moisture. In ordinary air, the creatures quickly shriveled up and died of desiccation. Only in air saturated with water vapor would they remain quiet. We furnished this environment for them by enclosing each worm in a separate container with a moisture-proof glass top, then adding a few drops of water to samples of the earth and leaf mold that had surrounded them in their native haunts. To test the food

preferences, various small insects (both dead and alive) were included in the containers. The *Peripatus* thrived, but we never could be sure that they ate anything. Certainly we never surprised one with its mouth full.

After the novelty of counting our *Peripatus* collection had worn off, the task of examining each specimen in detail began. Many of them, we learned, had 29 or 30 pairs of legs. Others bore 32 or 33 pairs. The former were males, and even in the largest species they never far

exceeded an inch in length. The individuals with more pairs of legs were females, and some of them reached four inches in length, though they were still of no greater diameter than a slender pencil.

Part of this discovery about sex came naturally. Those specimens with larger numbers of legs commenced to produce young ones—born alive and literally the "spitting images" of their parents. The average number of young was two—born on alternate days—but families ranged from one to three.

► LEAF DEBRIS among the spreading spiny roots of the stilt palm may yield a specimen or two



And unlike the collection of adults, where females outnumbered the males five to two, the number of females among the offspring was about equal to that of the males. Apparently in our collecting procedure we overlooked males but found the larger females, including many that were about to bring forth young.

Peripatus becomes sexually mature at about one year of age but may continue to grow for a year or two more if food is available in sufficient quantities. Old age is reached at six to eight years and is usually preceded by several annual crops of babies. There is a definite mating season, during which (in most species) the male deposits over the body of his mate large numbers of small sacs of sperm cells, each called a spermatophore. For a long while the next step in the process was unknown, but as recently as 1938 a British scientist discovered the route whereby the sperm cells reach the egg deep in the mother's body.

It seems that the presence of a spermatophore on the skin of a female Peripatus attracts white blood cells to the immediate region. These dissolve away the skin to form a pore through it and at the same time develop a bladder-like vesicle below that point on the surface. Soon the sperm emerge from the spermatophore, pass through the pore into the vesicle, and the skin heels again. The remains of the spermatophore are shed at the same time the outer layer of the skin is sloughed off—at the next molt, within a week or two. The sperm, meanwhile, have moved of their own power from the vesicle into the blood stream and through it to the ovary. There they are nourished and at the same time produce chemical substances that hasten the ripening of eggs. Eventually these burst from the ovary and are fertilized. This occurs about a month after the spermatophores are deposited as part of the mating procedure. And after the eggs are fertilized, as much as eight or nine months more must



▲ THE FAR-FLUNG BUTTRESSES of the giant *Bombacopsis* tree sometimes provide damp leafy haunts in which *Peripatus* finds shelter from the light of day

pass before the young are fully enough developed to be born. Thereupon some wander off while others remain with their parents as a little society.

Peripatus is carnivorous, but it has been found that its manner of eating is quiet and as different from that of other animals as is the creature itself. Around the mouth is a soft folded ridge that ordinarily is kept puckered together to hide the mouth itself. When food is found and *Peripatus* is ready to eat, this fold is turned out to form a circular lip, extending all around the mouth as a cylindrical sheath. The lip is moist

and can be applied closely to the surface of a pill bug or millipede, a termite or ant. Such a tight fit is possible that the animal can hold its prey by suction from the muscular pharynx. And while being held, the prey can be sliced into by double-bladed jaws, of which the mouth carries two, side by side. After a hole is cut into the victim, a strongly digestive saliva is poured into the wound. This liquifies the meal, so that *Peripatus* can suck back not only saliva but also the dissolved contents of its prey's body. Through a neat hole in the back of a pill bug the whole nourishment can be obtained —

leaving only an empty shell to be discarded when the suction of the pharynx is relaxed at last.

In these feeding operations, the famous slime glands appear to play no part. In fact, study of live *Peripatus* brings one to the conclusion that the slime is purely a defensive weapon. It is used quickly enough. Let anything press unexpectedly upon a *Peripatus*' back and the animal turns, raises its head slightly, and squirts from a pair of nozzles beside the mouth. Multiple streams of a clear sticky solution shoot squarely onto the offending object, even if it is three inches distant. The slime hardens in air more quickly than does nail polish or airplane glue and is about as strong an adhesive. It fails to stick to *Peripatus*' own skin, however. In this respect it is like water, for the skin is moisture-repellent, too, and a specimen dropped into water glistens like silver from the air film trapped next to its skin.

Such questions about *Peripatus*' behavior can be settled in only a relatively few parts of the earth. There are no members of this group of animals, for example, north of the Tropic Zone. Since most biologists restrict their studies to land above the Tropic of Cancer, they do not come in contact with live *Peripatus*—only with preserved specimens collected in the tropics. They may dissect these preserved samples and speculate on the function of the big salivary glands and still bigger slime glands. But they fail to see these in action.

Most kinds of *Peripatus* inhabit the Southern Hemisphere. Only in the West Indies and in Central America is there an appreciable number north of the equator. The 80-odd different species have been classified into two families. The *Peripatidae* are equatorial—in Malaya, Sumatra, central Africa, Central America, and tropical South America. The *Peripatopsidae* include two subfamilies. One is found in such East Indian islands as New Britain, New Guinea, and Ceram, and in southeastern South Africa. The other has members in southeastern

South Africa, Australia, Tasmania, and New Zealand, and an unusual outlier in Chile. In each region, however, the known species are extremely local and usually rare, so that finding any number of specimens is a major chore. Small wonder, then, that so much still remains to be learned of these animals.

Peripatus' claim to scientific fame rests on its body build. The cylindrical trunk with its more than two dozen legs suggests a caterpillar. But all the legs are alike, and *Peripatus* never turns into a butterfly or moth. Moreover, each leg ends in a little knob bearing a pair of claws—from which the whole group of animals gets its name—the *Onychophora*, or "claw bearers." The body is not arranged in a telescoping series of hard rings as in an insect or other earthpod. Instead, the skin is uniformly firm and flexible, raised in a myriad minute bumps arranged in encircling rings as well as in longitudinal lines, giving the superficial appearance of a soft, velvety, shineless surface. Similarly, *Peripatus* resembles insects and millipedes in breathing by means of delicate air tubes (tracheae) that ramify throughout the body and carry air to the internal organs without need for transport by the blood stream. But again the resemblance is only a suggestion, for *Peripatus* lacks any valves where these tracheae open to the outside of the body, and it is this lack of valves that makes them so vulnerable to dry air. They lose water eighty times as rapidly as a cockroach and die in a few hours if unable to escape to high humidity.

On the other hand, *Peripatus* shows many structural similarities to the annelid worms, and the general conclusion has been reached that in the distant past (perhaps a billion years ago) there was a single group of early worms ancestral to the present-day annelids, arthropods, and onychophorans. The annelid branch arising from this primitive type of animal turned in several directions—producing the predaceous and parasitic leeches,

the paddle-footed types such as clamworms, and the bristle-footed styles such as earthworms. Similarly the arthropod branch of the early worm organization divided into numerous branchlets which became highly successful: the crustaceans such as crabs and lobsters; the trilobites (now all extinct); the sea scorpions (now all extinct); the spider clan, including horseshoe crabs, land scorpions, ticks and mites, as well as spiders and harvestmen; the centipedes, millipedes, and insects. But the onychophoran branch remained pretty much as it was. It failed to turn into anything and as such managed to survive to the present as a sort of living fossil.

Living fossils of any kind are scientifically exciting to examine. And in *Peripatus* we have one that is remarkably like a real fossil, *Aysheaia pedunculata*, which was found as a clear imprint in some of the oldest known fossil-rich rocks—the Cambrian of North America. Like jellyfishes, which somehow left a good record of their delicate structure as tracery in shales of this same period, the soft body of the unarmored wormlike *Aysheaia* made a distinct mark in the mud. The rows of fleshy legs on each side of the body can be traced easily, and the two long tentacles on the head show plainly that the vast intervening time has produced no great change in the architectural style in this animal.

Only when one appreciates the absence of *Peripatus* from Europe and North America and its extremely retiring habits is it easy to understand why so widely distributed an animal should have remained completely unknown until 125 years ago. And even then, the clergyman who discovered the first *Peripatus* and gave it the name it has borne ever since thought he had found just a new kind of slug. He reported that this creature from the forested slopes of St. Vincent, in the Windward Islands of the Antilles near Trinidad, was a mollusk without a shell, with a pair of simple eyes at the base of two long tentacles. The Reverend Lansdown

Guilding was in error in this identification, but his Latin description and beautiful colored drawings of *Peripatus* leave nothing to be desired. As we watched living specimens in Panamanian jungles, we could not help recalling his error and seeing how easy it would have been to believe him right. For *Peripatus* moves at little better than a snail's pace, and an 1826-type hand lens might give few clues to differences in body design. *Peripatus* shortens and stretches its tentacles but does not turn them outside-in as a snail can. It raises its claw-bearing knobs in perfect timing as the many legs carry it along. Their action, however, is not co-ordinated on the two sides of the body as they are in centipede or millipede, and the gliding action of the whole animal is far more mollusk-like than worm-like or after the fashion of an arthropod.

Now that we have become acquainted at firsthand with live specimens of the worm that didn't turn, we are even more impressed with the immensity of time required for so retiring an animal to become widespread over the earth's surface. *Peripatus* is too intolerant of dry air, of molestation of any

kind, to make use of the common methods whereby animals spread from one region to another. In the rain, *Peripatus* will walk in the open. It will creep under a cover of fallen leaves if the humidity there is high. And so it must have crawled, generation after generation, for more than half a billion years, to spread itself at a snail's pace over the tropical regions of the earth, into the Australian region as far as Tasmania and New Zealand, into South Africa and down the jungle floors of South America as far as Chile.

It used only land bridges. Is it not remarkable that the creature has survived unchanged through so many millions of years since the time when there were, indeed, land bridges with suitable jungles growing on them, to shelter the lowly creature on its many long journeys? Presumably *Peripatus* was among the earliest animals to walk on land. If jungle conditions continue, there is no way to estimate how many more millions of years it may continue unchanged in habits and outward appearance — spitting on anything that annoys it, and finding enough to eat among the small animals in the upper soil.

▼ LIANAS hanging from strangler figs and other plants are conspicuous in the world of *Peripatus*, but the little creature has never risen far above the jungle floor during the millions of years it has been on earth



▲ A THREE-INCH PERIPATUS walking over a large fallen leaf. It's not a snail: it can't turn its tentacles outside-in. When molested, it squirts multiple streams of a clear sticky solution from a pair of nozzles beside the mouth. The fluid hardens in air more quickly than nail polish and is about as strong an adhesive



"HELL BELOW ZERO" shows the modern whaling industry at work in the Antarctic



This is a sock and slug drama, with the usual love complications

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

"Hell Below Zero"

"HELL Below Zero," writes Dr.

Robert Cushman Murphy, Chairman of the Department of Birds at the American Museum is an example of the sock and slug drama, which the late George Bernard Shaw in his only address in New York City called a foremost sign of American immaturity. In the course of the performance, there are three outright murders, a goodly number of additional homicides, and a parcel of beating-ups, some of which have no functional place in building the story. The attitude of hero and heroine toward all such cumulative violence is also most charmingly detached. When finding the still warm body of a shipmate, lying on the antarctic ice with a bullet through his head, one can almost hear or feel them say *So what!* as they proceed about their business.

"A reader might wonder what all the mayhem and slaughter have to do with natural history, so we must hasten to explain that the setting of the picture is a modern whaling campaign in the Antarctic Ocean. We see the operations

of a gargantuan whale-factory ship very vividly and accurately portrayed," writes Dr. Murphy, who knows about whaling from firsthand experience. Forty-two years ago he shipped out on an old-time New Bedford whaler bound for South Georgia. "We see the bloody and predatory hunt of the small whale-chasers that keep the ravenous appetite of the floating factory supplied with carcasses from which are processed oil, food for man and cattle, and fertilizer. The shooting in rapid succession of seven or eight of the largest animals that have ever lived, which are bumped off as casually as though they were pheasants on a game farm, may make audiences wonder about the wisdom and the ethics of such an exorbitant toll.

"The subheroine of the film is Jill Bennett in the guise of a Norse woman harpoon-gunner called Gerda Petersen. She is an inimitable actress and easily steals the show, although Erik Bland (Stanley Baker) also makes a superbly wicked villain."

"Hell Below Zero" was produced by Columbia Pictures.





"ELEPHANT WALK," photographed in Ceylon, is the story of life on a tea plantation, which is interrupted by some fantastic incidents



"Elephant Walk"

Reviewed by **GEORGE C. GOODWIN**
Associate Curator, Dept. of Mammals
American Museum of Natural History

THIS is a colorful and entertaining picture of life on a tea plantation in Ceylon. The story, as indicated by the title, is based on a trail that led to a waterhole that had been used by a herd of elephants from time immemorial. The title is well chosen since elephants cannot

gallop or run. Due to their great bulk they must literally walk, which can at best be increased only to a 25-mile-per-hour shuffle.

The picture opens with a fine old tusker at close range screaming defiance at civilization. Elephants put in an appearance on the elephant walk at regular intervals throughout the picture as a protest against the building of a mansion,

referred to as the elephant bungalow, right in the center of their trail.

Despite the fact that the building has been in existence for over 40 years, and elephants have an average life span of about 50 years, the public is expected to believe that the elephants would still try to follow the old trail, blocked though it was by a massive wall of brick and cement surrounding the elephant bungalow.

The climax comes when a prolonged drought has dried up all the available water supply. Led by a defiant old bull, the elephants, now maddened by thirst, break through the native guards and storm the wall, pushing down great blocks of masonry, and drive on right through the center of the bungalow. They crash through doors and windows, trample furniture underfoot, and in the melee overturn huge drums of kerosene, which ignite and spread through the building like flaming gasoline. In the finale, the elephants storm through to the other side of the house and gather in an artificial pool full of clear water in the courtyard. The elephants do not seem at all thirsty and are all good-natured and orderly, having executed their duties well, no doubt under the direction of unseen mahouts.

I am ready to go along with the supposition that the natives of Ceylon consider elephants people and hold them in reverence. Elephants are grand people. And these trustworthy trained creatures put on a great performance that equaled that of any of the other members of the cast.

"Elephant Walk" is a Paramount Pictures production.

Brief comments on films previously reviewed

Documentary and Grade A

Annapurna

The ascent of the now-famous mountain

Conquest of Everest

One of the greatest achievements in the history of exploration magnificently filmed

The Living Desert

Disney's first feature-length True-life Adventure film, showing animal and plant life in the Great American Desert

Song of the Land

Series of excellent movies of various forms of wildlife

Down the Alphabet

Beneath the 12-Mile Reef

Story of the fast-passing sponge industry in Florida Keys, filmed on location

His Majesty O'Keefe

Story of a ship captain marooned on the island of Yap. Yap islanders played by Fiji natives

What the Experts Said

Beautiful and deeply moving film

Stirring epic from on-the-spot material

Marvels disclosed in this film must be seen before one can sense full significance

Framework on which picture is built will mean different things to different people

Some noteworthy scenes of marine life woven into a story about the people who live in the Keys

Good entertainment. Blatant discrepancies. Dances beautiful and authentic



▲ THE DIP in the tree line in this photograph clearly shows where a century avalanche swept down the mountain. Younger trees can be seen growing in the path of the avalanche. Their size will indicate how much time has passed since the last slide. This view is along the Lyell fork of the Tuolumne River

Yosemite's **"CENTURY AVALANCHES"**

How the summer visitor can spot
signs of snow slides, new and old

By FRAN HUBBARD

▼ HERE the snapped-off trees were buried in stationary snow at the time an avalanche swept past. Their tops were carried away, leaving clear evidence of the depth of the snow at the time of the slide. This is between the Lower and Middle Lyell base camps, in Yosemite

National Park Service photos



EW avalanches are more spectacular, particularly in the years, than the so-called "century blanches," which at intervals slide down the slopes of California's Sierra Nevada range. Writing them, John Muir, who named them, said:

The great century avalanches occur on mountainsides about 100 or 12,000 feet high, where ordinary weather conditions snow accumulated from winter winter lies at rest for many years, leaving trees, 50 to 100 feet high, grow undisturbed on the slopes beneath them. On their way down through the woods they seldom fail to make a perfectly clean sweep, stripping off the soil as well as the trees, clearing paths 200 or 300 feet wide from the timber line to the glacier meadows or lakes, and leaving their uprooted trees, head downward, in rows along the sides of the gaps like lateral moraines. The trees and broken branches of the trees standing on the sides of the trees record the depth of the overwhelming flood; and when we come about the annual wood rings on the uprooted trees we learn that the occurrence of these immense avalanches occurs only once in a century or even longer intervals."

Particularly good examples of these events that have been swept away by avalanches, only to regenerate themselves, may be seen along the Lyell Fork of the Tuolumne River, south of Tuolumne Meadows, in Yosemite National Park. In addition to the century avalanches, the results of lesser snow slides may also be seen here. When a swiftly moving mass depends upon trees that are already partially buried by stationary snow, they are sometimes snapped off part way up their trunks. The depth of the standing snow can then be measured from the height of the trees that were beheaded by the avalanche.

ermen frustrated until the day we rode down Redfish Creek Canyon. They unpacked their rods dubiously, fought their way through bogs oozing with rivulets from the melting snow on Mt. Cramer, and cast their Royal Coachmen into Cramer Lake with abandon. That time they came back with their quota—70 Dolly Vardens and cutthroats.

Personally I am prejudiced. I considered our last camp at Hell Roarin' Lake the best. It was the hardest to reach, since the trail around Redfish Lake passed through a swamp where pack mules tore at each other cruelly when one would go down, and the saddle horses had to be led. On top of the ridge once again, we were on the level with some of the highest cathedral spires of the Sawtooths. Approaching the lake, we saw Mt. Cramer completely mirrored in its glassy surface. Even on this calm summer evening, however, the wind swept off the jutting peak and soured through the firs along the farther shore with a swelling rhythm. Hell Roarin' Lake and Creek had both been named for the volume of noise originating around the shoreline.

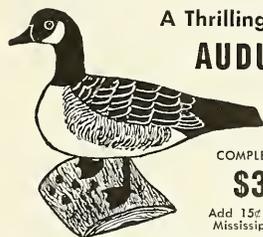
Hundreds of trout fingerlings leaped out of the water after voracious mosquitoes. Near timber line, a thin cloud of dust rose through the trees where our horses searched

for forage. Later that night, when we were sitting around the campfire, a scream shredded the stillness of the forested slopes across the lake. The cry wavered on a long thin note, then ended in abrupt strangulation. Our eyes widened as we looked at one another, asking an unuttered question.

"Probably a great-horned owl," one of the wranglers reassured us, "but it sure would be easy to tell you dudes that it was a cougar! Used to think so myself till a ranger put me wise."

Whether it actually was an owl or a cougar, the effect was the same. Here, indeed, was the essence of the wilderness. All of us knew innately that this was why we endured washing in streams of glacial frigidty, sitting out a rainstorm in cold misery, or withstanding the aches of muscles unaccustomed to the saddle. We believed it would have been worth it just to be able to see the unruffled beauty of Hell Roarin' Lake.

Long after the sun sank below the western edge of the lake, its glow rested on the impressive heights beyond. I recalled that Idaho had originally been named "Edaho" by the Indians: "Light on the Mountains." The next afternoon, as we left the mountains, light still pervaded the air over them and, when we said good-by, remained illusive within us.



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exceptional to encounter one who writes with such wit and flare as does Per Høst. This book is one of the most entertaining examples of escapist literature to appear for several years, but it is much more than that. Its Norwegian author, at one time an associate of the American Museum of Natural History, is a reputable zoologist by training, an amateur ethnologist of no mean ability, and a highly talented photographer. These skills have been combined in an informative tale of travel and adventure that takes the reader to the Arctic breeding grounds of the fur seal, to the Everglades of Florida, and finally to the jungles of Panama.

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Over half the book is devoted to a description of the author's experiences while studying wildlife at the Barro Colorado biological research station in Panama, and to his numerous visits to the Cuna and Chocó Indians of the Isthmus. It is here that Høst makes something of an original contribution to ethnology. For although the material on the Indians is informally and entertainingly presented, the author—being untrained as an anthropologist, and hence unbiased—has seen fit to note down details of native life that have not found their way into monographs by professionals. He tells us how a Chocó hunter, traveling in unfamiliar jungle, knows which fruits and nuts are edible, and why the Indians prefer poverty to riches, surely a novel idea in the present world. Moreover, Høst manages to make the Indians come to life and emerge as real personalities, a feat accomplished rarely in the writings of professional ethnologists. The numerous photographs are so striking that they alone would make the book worthwhile.

HARRY TSCHOPK, JR.

GEORGE CANSDALE'S ZOO BOOK

----- by George Cansdale

British Book Centre, Inc., \$2.00

64 pp., 72 photos

LIVING in an animal world, the superintendent of a zoological park cannot help but acquire a wide assortment of interesting details about his charges. Furthermore, he is apt to experience thrilling adventures, especially if he extends his activities to collecting specimens in distant fields.

George Cansdale gives us a colorful account of his stewardship as superintendent at the London Zoo during the past six years. From him we learn something about the intricate workings of a zoological park, the problem of procuring a constant supply of the great variety of foods necessary to keep a host of different animals alive and healthy. Every animal that becomes an inmate of this great institution, now totaling some 3000 individuals, has its case history recorded, and happenings are entered day by day in the Zoo chronicle.

Altogether this book contains a wide fund of information on the animals of the world, from insects to seahorses and from giant pythons to elephants and great apes.

Most of us have a soft spot for baby animals and their mothers, and Mr. Cansdale has devoted a whole chapter to this captivating subject. Besides dwelling at length on the lovable characters, like tiny bear cubs, mischievous lion kittens and baby elephants, the author tells us something about the extraordinary marital be-

haviour of some. The nesting habits of the hornbill is an example, where the cock bird plasters up its mate in a hole and feeds her and the young through a narrow slit until the babies are ready to fly. We find that the scorpion, though among the particularly unpleasant creatures, is one of the very few lower animals that bears living young and cares for them until they are old enough to hunt for themselves.

This is a book that will be enjoyed by children as well as adults. It should not be taken seriously as a textbook on zoology but rather as entertaining literature that will broaden our general knowledge of animal behavior.

The pictures represent more than 70 various subjects, exquisitely photographed. Many are of animals in action and add much to the value and attractiveness of the book.

George Cansdale came by his ability to care for wild animals naturally, for he had pets as far back as he can remember. Eventually he found himself in West Africa working as a Forest Officer and collecting animals for the London Zoo in his spare time. In 1947, he was invited to join the Zoo staff and shortly afterwards became superintendent.

GEORGE C. GOODWIN

THE LIVES OF WILD BIRDS

----- by Aretas A. Saunders

Doubleday and Co., \$3.50

256 pp., 21 pls.

MR. SAUNDERS is perhaps most widely known for his books about bird songs, but in the present volume he has widened the field. Over a period of fourteen years he taught a summer school course in bird study, and the subject matter of his lectures, in the field and classroom, forms the basis of this book, expanded and systematized. Chapters on identification and notebook keeping open the account, followed by sections dealing with nests and eggs, behavior, plumages, songs and calls, food, habitat, and conservation, illustrated by examples taken from the author's wide experience or from other recorded data. A brief bibliography is appended and a list given of the various species of birds mentioned in the general text.

The volume thus forms, in effect, a manual of what to look for in watching birds and where and how to seek them. If should prove useful to those who are in doubt about how to study birds in the field more intelligently and profitably than by simply listing the species seen. More experienced observers can enjoy "comparing notes" with the author.

JOHN T. ZIMMER

Fingers to hold

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we need begins—for every one of us.*

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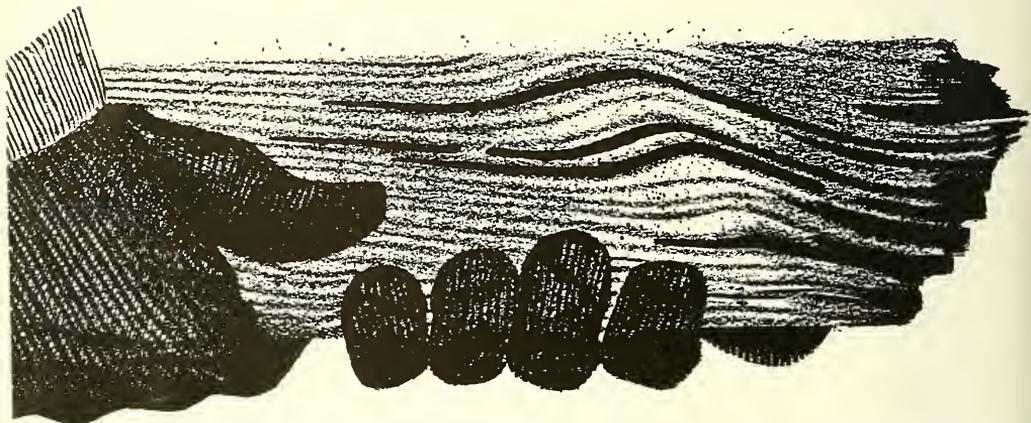


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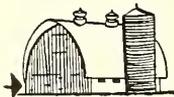
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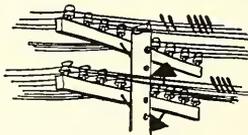
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LETTERS

Bird Houses and the Sun

SIRS:

Should bird houses always be placed so that they face east? I have been told that this is so but would like an expert opinion.

FRED C. NICHOLS

Trinidad, Colo.

"So far as I know," writes Dr. John T. Zimmer of the American Museum's Bird Department, "birds have no preference in this respect. In the wild, we don't find them choosing holes that face one direction more than another. Perhaps if storms came prevailingly from one direction at nesting time, a bird *might* choose the more sheltered of two nest boxes, but I wouldn't bet on it."

Dinosaur National Monument

SIRS:

I am writing in support of the views expressed in your recent article favoring the preservation of Dinosaur National Monument in its natural state.

When I wrote to Secretary Douglas McKay, who is a friend of mine, he replied to the effect that he had weighed the matter carefully, had considered it from all sides, and concluded that the dam should be constructed.

The Secretary is a sincere and capable person, for whom I have the very highest regard. Usually I find myself in full agreement with his policies. In this instance I am convinced he has been inaccurately advised. I wish he might make the Yampa run. I think he would oppose as I do the Echo Park Dam and also additional dams being considered for the Upper Colorado.

I ran the Colorado River by cataract boat in 1948 from Lees Ferry to Lake Mead. I repeated the trip in 1949. In 1950 I ran the San Juan River by Folboat. In 1952 I ran the upper Glen Canyon area of the Colorado by Folboat.

I have been going West for extended vacations for quite a few years. It has been my privilege to become rather well acquainted with our National Parks, our desert regions, and our Western rivers. In the company of skilled geologists, I have had an opportunity to study the

"history books" of the ages that are unfolded in these great Western canyons and in them alone. In 1949 I was invited to speak at Boulder City at a meeting of the Bureau of Reclamation. At that time, I expressed it as my opinion that anyone who had run the great Western canyons by boat would never cast a vote in favor of destroying those utterly unique and irreplaceable areas, which portray so much of the history of the earth and of ancient forms of life.

I show my motion pictures and lecture in person perhaps 30 or 40 times a year, gratuitously and solely for the pleasure others find in these inspiring regions. I wholeheartedly believe in the development of our resources. I believe equally, however, that we owe a debt to those who follow us, not to destroy these unique opportunities for inspiration and education. I cannot understand the wisdom of impounding streams and desert areas for the purpose of increasing the supply of agricultural products when current surpluses are a heavy economic burden. I regard it as tragic when such dams destroy for all time many of our most valuable geological "history books."

FRANK E. MASLAND, JR.

Carlisle, Pa.

SIRS:

It was my good fortune to be permitted to navigate the rugged section of the Yampa and the Green last summer with my son, and I was so impressed with it that I wish to do all in my power to assure his son and grandson the same rare privilege. As many others have no doubt also felt it their duty to do, I have ventured to express this view in a letter to President Eisenhower. Secretary McKay apparently favors construction of Echo Park Dam as a part of the Colorado River control project, and I have urged the President, before concurring with him, to please consider very carefully the eternal effect it will have on one of the most unique and scientifically valuable wilderness areas we still possess—Dinosaur National Monument.

Not being an engineer, I have no technical advice to offer, but I am assured that many qualified men have flatly stated that alternate sites *are* available which will store *more* water and cost *less*, yet not destroy the beauty and value of this primitive tract.

A. C. HART

Arenville, Ill.

SIRS:

I am taking the liberty of enclosing a copy of a letter my father wrote in response to an article in one of the other magazines favoring the preservation of Dinosaur National Monument. Since you also published an article defending this area, you might want to hear his views. I feel that any information that may aid the battle to save the natural

continued on page 239



Photo by A. M. Deig

▲ "HOW DRY I AM..."

NATURAL HISTORY

The Magazine of the American Museum of Natural History

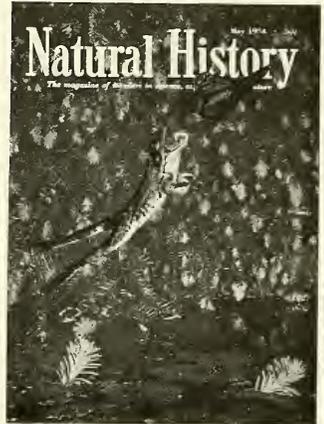
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May, 1954
Volume LXIII, No. 5

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<i>You will find NATURAL HISTORY Magazine indexed in Reader's Guide to Periodical Literature in your library</i>		



THE COVER THIS MONTH

Were frogs not so commonplace, their leaping ability would undoubtedly arouse much astonishment. Most of us have heard the sudden splash of a frog jumping from a river bank to the safety of the water. But this remarkable photograph in color shows how the Green Frog (*Rana clamitans*) uses his limbs as part of a food-getting mechanism. The sticky tongue, attached in front instead of behind like ours, helps entrap the insect on the wing and draws it backward into the mouth. As the frog ends its leap, it uses its hands to tuck the wings or other projections into its mouth, where the morsel is promptly swallowed. The frog evidently sees small objects best at a distance of a few feet; and when it leaps, it rarely misses. However, the frog depends upon movement to attract its attention and may overlook motionless prey.

This photograph won a silver medal of the Photographic Society of America at the 14th International Exhibition of Nature Photography in 1952.

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John and William Bartram • World's Food
Bird Guide • Men and Sharks • Flowers

NEW GREEN WORLD

----- by Josephine Herbst

Hastings House, \$4.00
272 pp., 9 illus., 1 map

THE STORY of *New Green World* gives us an intimate insight into the lives of two famous botanists, John Bartram and his son William.

John Bartram (1699-1777) was famous for his garden. His home was on the banks of the Schuylkill River. His house still stands in what is now Philadelphia, and the grounds have been made into a city park, Bartram Park. Bartram traveled extensively, mostly on horseback, from the New England states and the Catskill Mountains to Florida. He also made one trip for the British Government to the Great Lakes region. Wherever he went he gathered plants and seeds to be planted in his garden, distributed among his friends, or shipped to Europe. Many of Linnaeus' types were collected by him. His son William (1739-1823) was a talented artist and at his father's death took up his residence at the old home. William was not only a botanist but also an ornithologist of note. One of the Bartrams' best-known discoveries was *Franklinia Altamaha*, found on the banks of the Altamaha River in southeastern Georgia. The seeds of this tree were brought back to Pennsylvania and planted. Now known as Ben Franklin's Tree, it is frequently sold by horticulturists. All existing trees have descended from the seeds brought back to the Bartram garden, for the original trees on the banks of the Altamaha have disappeared and no other wild tree has since been discovered. (See *NATURAL HISTORY*, vol. 46, page 24, and vol. 54 cover and page 348.)

Josephine Herbst had access to the extensive correspondence carried on by John Bartram and his son with their many friends and associates, both in this country and in Europe. From this multitude of letters and the many field notes she has written her story.

The author has a poetic nature, as is shown by her frequent references to the poets and their works, and this is also shown in her writings, perhaps a bit too much so in the opinion of this critic. She is inclined to leave an interesting happening before its conclusion and be off in another year or on another trip without due warning. It would seem

better if more quotes were used. At the end of her story, one has a feeling that much of importance has been missed. If Miss Herbst has sought to make one want to read more of the lives of the Bartrams, she has succeeded well. Fortunately, the book contains a very good bibliography, where one may read and find the answers. This I intend to do.

On the whole, the text is well written and enjoyable.

T. DONALD CARTER

MEN AND SHARKS

----- by Hans Hass

(translated from the German by
Barrows Mussey)
Doubleday & Co., \$3.95
318 pp., 64 photos

IT WAS once a popular belief that a person unfortunate enough to be caught in the same water with a shark was practically doomed. If he lived, it was only by a narrow escape. Today with thousands of skin diving enthusiasts exploring the watery world and meeting sharks every day, the public is gradually learning—what South Sea divers have known for centuries—that it is really not very dangerous to be in the water with a shark. For most divers, however, it is still an uncomfortable feeling, but there are a few who derive such enjoyment from underwater encounters with sharks that they may even organize an expedition with the purpose of swimming in the water with as many of the largest sharks as they can possibly find. Such a man is Hans Hass, whose expedition to Grecian waters, described in *Men and Sharks*, accomplished this mission.

Dr. Hass' style of writing is for the most part light and amusing, though in a few places, where it records too many details of the uneventful day-to-day activities of the expedition, it reads like a diary in need of editing. Some of Dr. Hass' philosophical views on marine biology are fresh and entertaining but not without errors. (Life on earth began considerably earlier than 100 million years ago, and there is no fish "consisting solely of a huge mouth with a tiny tail directly connected.") At times, Dr. Hass seems also to be confused in his Greek history. The famous battle of Salamis was not fought on the east coast of Cyprus "as any half-educated person knows" (Lieber nichts wissen als vieles halb wissen).

There were times when Dr. Hass and his party counted as many as seventeen sharks in their field of vision at one time—sharks that had been attracted by dead and dying fish. But as Dr. Hass points out himself, his method for attracting sharks was deplorable. It is saddening to think that some Greek fishermen resorted to the destructive habit of dynamiting their coasts in order to obtain fish. But that a visiting scientist and his crew should join in this illegal and wasteful practice for the purpose of making shark movies will leave a bitter taste with many readers.

As in Dr. Hass' previous book, *Manta: Under the Red Sea with Spear and Camera*, the material in *Men and Sharks* (which chronologically should have been published before *Manta* and was in the German edition) is spread a bit thin, and we learn little about sharks aside from descriptions of Hass' meetings with them—descriptions, however, which make exciting reading and are supported with unusual photographs.

EUGENIE CLARK

THE WORLD'S FOOD

A Study of the Interrelations of World
Population, National Diets and
Food Potentials

----- by M. K. Bennett

Harper & Brothers, \$4.00, 282 pp.

THE STRIKING thing about Mr. Bennett's book on food and world population is its relative optimism for the immediate future. Recent publications on similar themes have depicted a most dire future descending upon us as a result of rapidly expanded populations, increasing inadequacy of food supplies, and wasting of soils and other natural resources. Mr. Bennett, on the contrary, finds evidence that food supplies have actually been increasing in the past to keep up with the expansion of population, and he can see no reason why for the next 50 years this relationship cannot be maintained, provided the world economic structure is not dislocated by war or economic isolationism. The ceiling on food production is not yet in sight. The pressure of population growth does not scare him too easily, since people have it in their power to do something about that when the pressures become too acute.

Mr. Bennett is again far more cheer-

NATURAL HISTORY, MAY, 1954

ful than many of his colleagues in surveying the present world food situation. Much of the alarm over the so-called "geography of hunger" and the supposed malnutrition that is said to afflict two-thirds of the world population arises from subjective interpretation of inadequate data. How you define hunger and whether you can infer malnutrition from available data on national food consumption are crucial here. Mr. Bennett points out how unlikely it is from the evidence that chronic hunger actually characterizes much of the world's population, and from his critical assay of the available statistics, he rejects widespread malnutrition.

Actually, as the author reiterates, far too little is known about food requirements and food balance sheets to draw some of the more pessimistic conclusions that are now so widely current.

Mr. Bennett's views are bound to be unpalatable to many writers on this subject, but he must be accorded a high mark for his skill in presenting his ideas and for his highly developed critical acumen in appraising what appears to be very refractory data.

HARRY L. SHAPIRO

CRUICKSHANK'S POCKET GUIDE TO THE BIRDS

(Eastern and Central North America)

----- by Allan Cruickshank

Dodd, Mead & Co., \$2.95
216 pp., 22 pp. of color photos,
numerous line drawings

A GENERATION ago, all bird books that were intended to help observers identify their finds include detailed descriptions of the species in the

region covered. Later, and largely through the originality of Roger Tory Peterson, descriptions were replaced by *diagnoses*, that is by what might be called the least common denominator in distinguishing one species from another. The trend has proved extremely practical and has been widely followed. In the present pocket guide, Allan D. Cruickshank carries it to its logical conclusion.

This guide differs from virtually all of its predecessors in that it presupposes absolutely no knowledge of birds on the part of the user. In spite of such an approach, it turns out by actual test to be almost as pertinent in the field work of a veteran as of a beginner.

The author realizes that a large number of bird-lovers, young in either years or experience, must begin the process of recognition by being able to know the family of an unfamiliar bird before they can hope to name its species. His first object, through the use of simple illustrations and pithy clauses, has therefore been to pin down the characteristics of family and generic groups—how to tell a nuthatch from a woodpecker, etc.—after which, the rest of the task may prove easy. To simplify still further, he has arranged his key illustrations by habitat rather than by generic relationship.

Coming now to the particular bird, we find that the concise descriptions, which rarely extend beyond six or seven lines of type, emphasize the characteristics of plumage, voice, actions, and environment which make each species exactly what it is, and nothing else. The more important of these features are printed in heavy type so that they hit the reader's eye at

the very moment when his "prey" may be flitting from twig to twig overhead.

Seventy-eight line drawings by Don Eckelberry are characteristically vigorous and articulate. A beautiful feature of the book are the 72 natural color photographs by Mrs. Cruickshank. Among these are some of the most satisfying close-up portraits of birds that have ever been made.

R.C.M.

THE SOUTHERN INDIANS:

The Story of the Civilized Tribes
Before Removal

----- by R. S. Cotterill

University of Oklahoma Press, \$4.00
255 pp., 8 illus., 5 maps

IN NO PART of North America did the Indian play a more important role in American history than along the eastern seaboard. But while the public is generally aware of the part played by the northeastern tribes, the southern Indian in history is less well known. This book tells the story of the southeastern tribes—primarily the Creek, Cherokee, Choctaw, and Chickasaw—during the half century prior to their removal to Indian Territory in 1830.

As history, it is a scholarly piece of work, and the author has utilized new and hitherto untapped source material, much of it inaccessible to the average reader. The story—which is yet another eloquent record of our failure and inability as a nation to deal fairly with the Indian—throws light on several important

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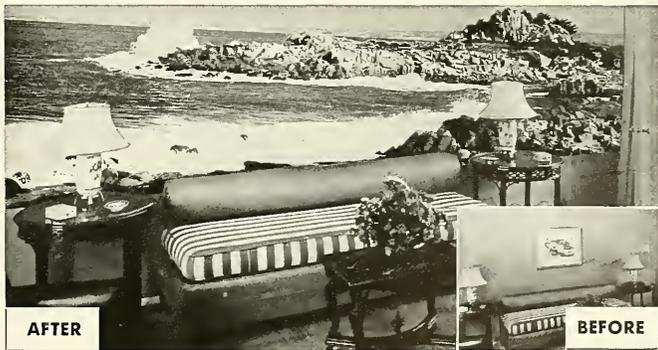
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phases of American history, and in this respect the book is a very real and original contribution. In fact, it is packed so tightly with highly detailed factual material that it is not easy reading.

On the other hand, the introductory chapter—and the only chapter dealing with the culture of the southeastern Indians as such—contains so many inaccuracies and misstatements that special attention must be called to this portion of the book. Here the author blandly discusses the movements and locations of

the southeastern tribes during the seventeenth century and earlier without recourse to *any* of the excellent recent archaeological publications bearing specifically upon these matters. The most authoritative single study of southeastern ethnology is ignored altogether, and important Spanish sources, such as those of the De Soto expedition, are not even mentioned.

Yet one short and very general chapter, however bad, should not detract too much from what is, on the whole, an important and useful book.

HARRY TSCHOPIK, JR.

FLOWER ARRANGEMENT WORKBOOK

----- by Myra J. Brooks

M. Barrows and Co., \$2.50

26 pp., 48 photos

COLOR IN FLOWER ARRANGEMENT

----- by Adelaide B. Wilson

M. Barrows and Co., \$5.95

128 pp., 16 color plates

DAHLIAS FOR EVERY GARDEN

----- by Marian C. Walker

M. Barrows and Co., \$2.95

128 pp., 16 photos

present reviewer, such free associations of ideas and emotions have no place in a book that aims to be a simple guide to color for the flower arranger. The much useful information embedded in the book would be more accessible were the prose pruned of its excesses.

The third volume is a simple presentation to the amateur gardener of all he needs to know about Dahlia growing. It contains information on all aspects of the subject, from pest control to suggestions for organizing a Dahlia show and where to buy one's plants. The style is unpretentious and easy to read, and the photographs are good. The book is written from experience and is full of the little practical hints which that fact implies.

NICHOLAS GUPPY

BYWAYS IN HAND-WEAVING

----- by Mary Meigs Atwater

The Macmillan Company, \$8.50

128 pp., 27 illus., 36 diagrams

AS a rule books written for the benefit of handweavers are considered too specialized for reviews here. We can justify an exception in this instance as the author has brought together from all over the world data on various ancient handicraft products. Her objective is to enable anyone with some knowledge of weaving to learn and utilize techniques, most of which are neglected or generally overlooked. These include card weaving, "inkles," twining, braiding, plaiting, and warp pattern belting. By simple explanation, good diagrams, and illustrations, these are made clear and readily understandable.

Comments on the antiquity and distribution of the techniques are only incidental, so it is not a source book for such data.

JUNUS B. BIRD

THE HERRING GULL'S WORLD

----- by Niko Tinbergen

Collins, St. James Place, London, 18S

253 pp., 51 photos, 58 drawings

DR. TINBERGEN needs no introduction to the student of bird behavior. For many years he has been active in this field, as a long list of pertinent papers attests. Many of these papers have reported his studies of Herring Gulls, and we now have a comprehensive consolidation of these studies with the addition of newer data and occasional modifications of earlier conclusions.

It is impossible to list here all the topics that are treated in the book. Dr. Tinbergen has given a detailed picture of the

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life of the Herring Gull on its breeding ground. If the picture is incomplete, as he maintains, it is clear and colorful and a mine of information. Mention should be made also of the fine series of photographs that illustrate the volume, taken by the author.

JOHN T. ZIMMER

PLANT LIFE IN MALAYA

----- by R. E. Holtum

Longmans, Green and Co., London 18/-
254 pp., 51 figs.

IN TEMPERATE parts of the world we are accustomed to plants that behave in a predictable manner: they shed their leaves for the winter, or flower in the spring. What would we say to an avenue of trees in which each pursued its own independent course, flowering as an individual, about once every nine months? This is what *Lagerstroemia flos-reginae* does in the streets of Singapore. In a climate that scarcely varies from one part of the year to another, many peculiar things happen. Some plants, lacking the stimulus for flowering, may never do so, or only at long intervals of years; others which require no stimulus, may flower and seed continuously. These and other strange phenomena are familiar to all who have lived in the wet tropics, but their whys and wherefores are often obscure. To any such person who is interested in the curious plants he has seen and who wants more than superficialities, this book will be a source of much delight. It is written by a man who had devoted his life to his work as a botanist in Malaya, and who has thought long on his subject. Now with wisdom and sincere humility he is sharing its pleasure with us; page by page he throws light upon the mysteries of the tropical forest and its multitudinous plant life. His examples are carefully chosen to illustrate a wide range of topics, from structural adaptation to physiology and response; each selected plant is considered first of all in itself and then in relationship with the conditions of the world in which it lives, and generalization is firmly anchored to the particular known example.

The illustrations are not always as clear as one would like; and the style, if always readable, is not light. But for its thoughtfulness and sobriety and the rarity with which its subject is treated in semi-popular form, this book is most strongly recommended.

NICHOLAS GUPPY

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NH-2

The heroic attempt of Salomon August Andrée in 1897 to discover the North Pole in a balloon resulted in one of the strangest mysteries in the annals of Arctic exploration and a still stranger solution

PROPPED against the side of a small hill was the headless body of a man with his feet half buried in the snow. Captain Peder Eliassen, skipper of a motor launch belonging to the whaling ship *M/S Bratvaag*, stared down at the figure in awe, while at his side the two young harpooners told him how they had come upon it.

Toward noon on a glittering day in August of 1930, two motor boats carrying harpooners had left the Norwegian whaling ship and in unusually quiet waters put in to White Island. White Island, lying about 100 miles northeast of the main island of Spitsbergen, is ordinarily inaccessible, but there was open water, and the sun shone in a cloudless sky. The ship was equipped for scientific observation and carried a sealer's crew to hunt walrus, seals, and whales.

The two motorboats were cruising about offshore, and some of the men had gone on shore to pull walrus carcasses up on the beach. The hunters perspired at their work, and two of the men, Olav Salen and Karl Tusvik, walked inland across the barren island in search of fresh water to quench their thirst.

Snow covered most of the hills, but here and there the men could see stretches of gravel and sand. The otherwise monotonous landscape was relieved by a shallow lake and sparse vegetation. As they looked about for drinking water, they found an aluminum pot lid and were amazed. Then they noticed a dark object a little distance inland. Approaching it, they came upon the ruins of an old boat, fastened to a sledge whose runners were badly worn. Protruding from the snow was a boathook on which they could clearly read the words: "ANDREE POLAR EXPEDITION, 1896."

For a moment they did not take in the full significance of their discovery. As realization came to them, they ran to the landing point to tell the others of their find. Their skipper hurried back with them to take up the search.

Skipper Eliassen returned to the *Bratvaag* taking with him a heavy, wet book that he had found in the old boat. Handing it to the scientists on board, he announced that the remains of the explorer Salomon August Andrée had been found.

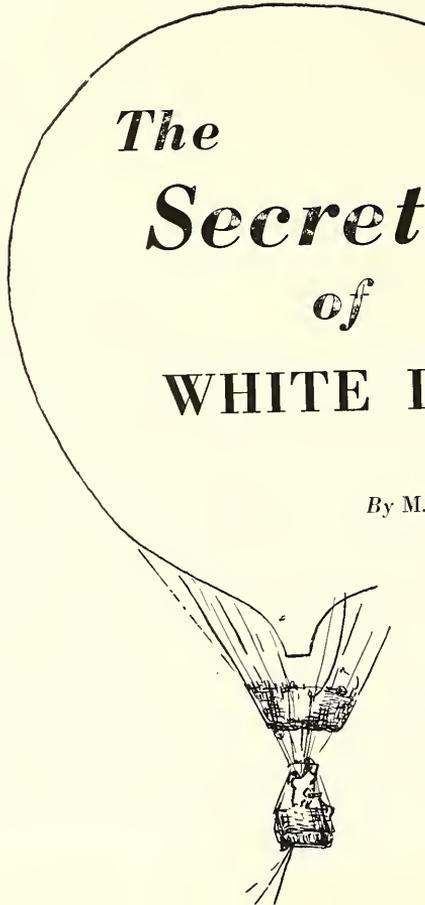
Dr. Gunnar Horn and the other scientists hurried ashore to Andrée's last camp. Here at last, they

thought, could be found the solution to the mystery that had puzzled the world for 33 years—the tragic fate of Salomon August Andrée and his two companions, who in 1897 had sailed aloft in a 97-foot balloon in a daring attempt to discover the North Pole by air.

Andrée's clothed body, leaning against the rock, was identified by the monogram on his arctic suit. Not far from Andrée they found a partly filled Primus stove. Near by, somewhat covered with stones, was the body believed to be that of the 23-year-old scientist Nils Strindberg.

The Secret of WHITE ISLAND

By M. C. PERGANDE





United Press photo

▲ THE LAST PHOTOGRAPH of the "Eagle" as it left Spitsbergen carrying Andrée and his two companions on their ill-fated quest

The crew worked carefully under Dr. Horn's direction to bring to the surface things belonging to the expedition, such as instruments, clothing, a bag of books, and photographic apparatus. They found warm clothing, sufficient food rations, and fuel for the stove.

As they worked, they must have wondered what had happened to these courageous men. Had one of the three succumbed to the desire for sleep first, or had he met with an accident, or committed suicide? Had he perhaps been murdered and laid here by his two companions? Of the third member of the brave party, Knut Fraenkel, athlete and adventurer, only a few bones remained.

From Andrée's first diary of 118 pages, embracing the period from July 11 to October 2, 1897, and his second diary of four and a half partly legible pages; and from Strindberg's notes and observations

and Fraenkel's Almanac, the ill-fated balloon voyage and the long trip across the ice was reconstructed.

During the summer of 1896, Andrée and his two companions, Nils Strindberg and Knut Hjalmar Ferdinand Fraenkel, liberally aided by the Swedish government, made extensive preparations at their base on Dane's Island, Spitsbergen. The "Oernen," or "Eagle," as they had called their balloon, was inflated with hydrogen and kept in readiness for the south wind that was needed to make their take-off in the direction of the North Pole. But it was not until Sunday, July 11, 1897, that the favorable wind blew and the lines were cast off. The huge balloon rose from the ground. Its crew of three were in high spirits and fully confident of success.

Soon after the take-off, a mishap occurred. The drag-lines of the balloon broke. The loss of these

ropes meant that their valuable ballast was lessened. Later in the day, Strindberg's diary mentions that gas had been lost. In spite of the leak, the "Eagle" continued to rise and travel at a speed of about 22 miles an hour. As they sailed over Vogelsang Island, Strindberg dropped a tin containing a note to be sent to his fiancée, Anna Charliers. Each man was occupied with his appointed tasks—taking pictures, maneuvering the clumsy balloon, or whatever it might be. About five o'clock in the afternoon of the first day, they released the first of their carrier pigeons, with a message giving their course and position.

The speed of the balloon diminished and it began to lose altitude as clouds closed in around them, obscuring vision. Two hours later, however, they had again soared to their original height. The gondola had been equipped with berths,



Brown Brothers photo

▲ ANDRÉE (at left) with three officers and a fourth member of the expedition

▼ ANDRÉE and his co-workers tightening the guy ropes on their balloon before taking off on their drift toward the Pole

United Press photo



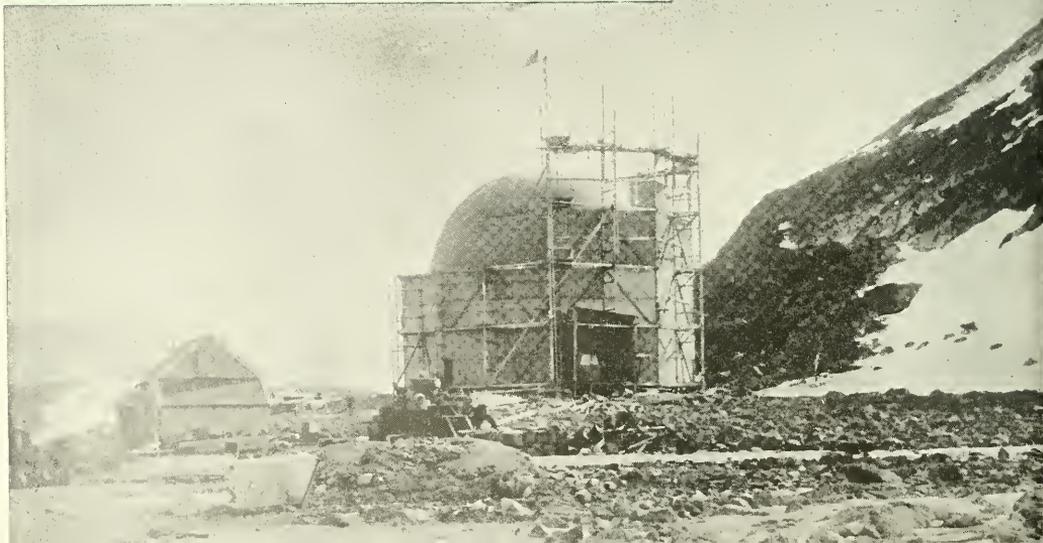
▼ SHORTLY before the departure, this photograph was taken showing the balloon in its protective hangar. Near by is the gas generator

United Press Photo

and Andrée went to sleep while Strindberg and Fraenkel talked quietly as they kept watch. Through breaks in the clouds, they could see rough ice beneath them, and when two hours later the balloon began to fall slowly, they threw out sand to decrease their weight. From then until midnight, they dropped rope rungs, sand bags, and buoys in an effort to regain lost altitude. For a short time they would rise; and with any gain, their prospects brightened, but not for long. Added to the difficulties caused by loss of altitude, a dense fog began to rise all around them.

An entry in Strindberg's notes at 1:30 A. M. on July 12, the second day out, mentions that their course had changed to the east. For several hours the balloon hung motionless in a dead calm. They released two more of their pigeons at 11:00 that same morning and watched them disappear into the fog.

They were now so low that the guide lines were dragging on the ice, and at noon they received a warning of what was to follow. The basket began to bump against the jagged ice below them. They worked doggedly to regain their lost height by dropping overboard all the ballast that could be spared, even to the large, specially marked



buoy that they had planned to drop over the Pole. The gondola continued its nerve-jarring crashes along the ice. The men were exhausted, and a form of sea-sickness occurred.

Early in the morning of the thirteenth, the guide lines caught around a large block of ice and held the balloon fast. A sudden blast of wind freed the ropes and carried them upward, increasing their speed. Their hope returned, but a new danger loomed. Ice and frost was forming on the rigging, adding to their weight. The last of their sand ballast, some of their precious food, and a medicine case were dumped in an attempt to lift their craft higher into the air. In Andrée's diary for this date is a frightening entry, "Fire." It was extinguished immediately however, with no serious damage. Finally, the weight of the ice that covered the big bag forced them to descend the following day. The last entry in the diary reads, "Anchored on an ice floe at 7:30 o'clock on the morning of July 14." They realized then that the goal of their dreams still lay some 500 miles away and that they would never reach it in their balloon.

The three fatigued and hungry men camped on the ice after landing and after a brief rest made preparations for their return to civilization.

Their journey took them across crumbling ice and over occasional stretches of open water, which they

crossed in a small canvas boat. After thirteen days of travel, they realized that the drift was faster to the west than they could walk to the east. It was then that they decided to go with the drift rather than against it, in the hope that it would bring them to the Seven Islands, where food had been cached by the Swedish government.

In spite of the hazards, during all of their 200-mile trek across the arctic ice fields, they made valuable astronomical and meteorological observations and collected interesting specimens of arctic moss and clay. They even took time to honor Strindberg's fiancée, Anna Charliers, on her birthday!

They suffered from bruised feet and several times fell into pools of icy water that had been concealed by thin layers of snow. Yet they plodded on, keeping up one another's spirits with jokes and laughter. Rough ice, the uncertainty of their course, fatigue, and occasional illness made the journey a difficult one, but in spite of the hardships, they never lost their excellent spirits, they never gave up hope.

The provisions they had taken from the balloon decreased rapidly, and they used all their skill in hunting polar bears and creating food from seaweed and ice moss. Though they were unaccustomed to the food, they knew its value and always managed to make a kill when their rations were low.

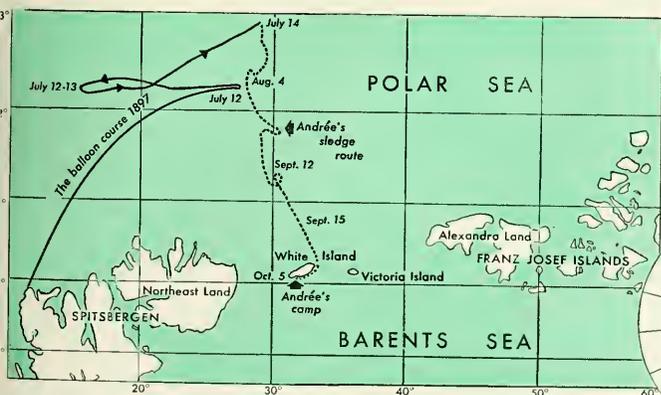
As they approached the northern coast of Spitsbergen, the drift of

the ice began to change, carrying them away from the Seven Islands and the food cached there. But they were not discouraged, and they continued building an "ice cabin" on the large floe on which they had been drifting. They sighted White Island on the seventeenth of September, and the following day they added to their good fortune by making a kill of four seals and a polar bear, which gave them enough meat for several months. Then, on the morning of October 1, within sight of White Island, another misfortune struck them. The floe on which they had built their shelter suddenly split apart with a crashing sound, scattering their equipment and provisions about on pieces of floating ice. Momentarily stunned, they did not lose any time in plunging into the icy waters in an attempt to save their precious stores.

The following morning, as their little floe drifted within landing distance of White Island, they hastily transferred their possessions to the boat and rowed to the safety of land. Here at least they could have a stationary camp that would not scatter into pieces under their feet. They settled down for the long arctic winter, not even now expressing any fear or giving up the hope of returning to their homes.

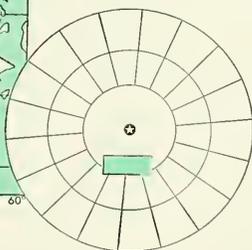
In the diary found with Andrée's body, the entries end abruptly on October 8, 1897.

What happened to them? Scien-



THE BALLOON drifted for 65 hours, then came down on the ice about 180 miles from the nearest land

Map redrawn after H. N. Pallen and Vilhjalmur Stefansson



tists, newspapermen, and assorted "guessers" both here and abroad, expressed varying opinions as to the fate of the expedition. The theories ranged from death by food poisoning to murder and suicide caused by panic or despondency. The most frequently expressed theory was that the long severe march had taken its toll of their strength and that they "slept themselves into death" from cold or exposure.

In sharp contrast is the explanation given by the noted explorer Dr. Vilhjalmur Stefansson, long regarded as an outstanding expert on arctic matters. In his book *Unsolved Mysteries of the Arctic* published by MacMillan in 1938 and now in its seventh printing, he gives a series of deductions, worthy of Sherlock Holmes. He analyzes one theory after another and gives his own conclusions as follows:

Andrée, at 42, was a man of over ten years' experience in the polar regions. His two companions were equally well qualified for such an expedition, both in technical knowledge and physical strength. All three were experienced in ballooning and were prepared for the pos-

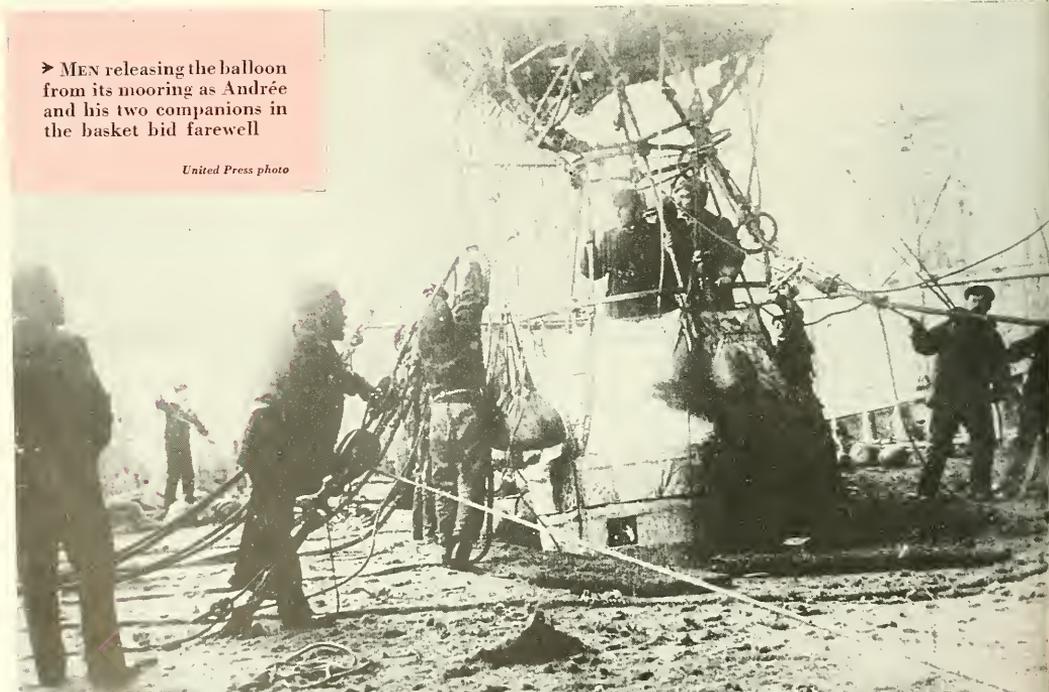
sibility that they might not reach their goal and be forced to return on foot. They were equipped to live in the arctic by hunting bears and seals, which would provide them with both food and fuel. The previous year, the explorer Nansen and a companion had lived through the winter of 1895-1896 with less equipment than the Andrée party now had, so they were confident that the venture could be made in comparative safety.

Throughout the trip, they had been eating their prepared food with no mention of ill effects. In the beginning of the march, diarrhea is mentioned in Andrée's notes, but according to Dr. Stefansson, this would be caused from eating the lean bear meat without enough fat to compensate for the lack of sugar and starches in their diet. When they began to fry meat in bear fat, after their butter supply was exhausted, the condition stopped. Also, Andrée was aware that most bear livers are poisonous and mentions that they avoided them, so there would be little reason to believe that death could have resulted from food poisoning.

Strindberg died first, possibly not more than a few days before Andrée and Fraenkel. He had been buried about 30 yards away from the camp, his body covered with stones. The three men were admirably matched temperamentally and had had no quarrels on the long trek over the ice when fatigue would have made tempers short. It is unlikely therefore that Strindberg's death or theirs could have been caused by murder or suicide. At no time were they despondent—disappointed perhaps, but not desperate. They were not men who would be thrown into panic at the thought of their position. They had already withstood the rigors of the arctic and were now more secure than before, with, as Andrée wrote, "enough meat to last until April." So there is nothing to indicate that they were anything but confident of returning to try again. Strindberg's death, Dr. Stefansson deduces, was most likely caused by drowning while hunting a seal or bear near the camp; or perhaps he suffered an attack of appendicitis, which could have developed into peritonitis.

➤ MEN releasing the balloon from its mooring as Andrée and his two companions in the basket bid farewell

United Press photo



Found with the bodies was a great deal of warm extra clothing and a large sleeping bag. The Primus stove was still partly filled with fuel, and their hunting of seals would have given them sufficient blubber for heat after the supply of oil had run out. Their tent was made of varnished balloon cloth, which would serve as a protection from the arctic winds. All of this would surely rule out the possibility that they might have died in their sleep of the cold.

Dr. Stefansson's conclusion is that Andrée and Fraenkel died of carbon monoxide poisoning without even being aware of their danger! The arctic snow at that time of the year was wet and sticky. Andrée wrote that "the wind was increasing and creating a drift," which would tend to close up any cracks in their wind-proofed tent, leaving them with no ventilation. The air valve of their Primus stove was closed when it was found, indicating that they had not turned it off, and the stove was probably being used to cook their evening meal. Carbon monoxide is treacherous in that it is a colorless, odorless, and very poisonous gas. The men were undoubtedly overcome, Stefansson argues, as they sat in the tent, just as people are today when they leave a car running in a closed garage.

For a time, the world wondered anxiously about their fate, even sending an expedition in August of 1898 to search for them. But nothing was heard of Andrée and his companions, and gradually they were forgotten. Locked within its snows for 33 years, the Arctic finally surrendered its secret to the world, thus writing the final chapter in a chronicle of a bold but tragic attempt to conquer the Pole.

➤ THE MEN LIVED by hunting and more than once took time to photograph their kill



Brown Brothers photo

▲ THE NEGATIVES of this and the following two photographs lay near the bodies of Andrée and his companion for 33 years before being discovered. This picture was taken by Nils Strindberg on July 22, 1897, eight days after the balloon crashed on the ice. It shows Andrée (right) and Knut Fraenkel packing their scant equipment, ready to set out in search of land



International News photo

▲ THE THREE BALLOONISTS pushing their boat over the sea ice on a sledge carried for the purpose

International News photo





▲ MIRANDA IN HER dining room. The spokes as well as the hub of the web are composed of firm, dry silk. The spiral network is of sticky, elastic strands

IN Nature's theater there are many craftsmen whose exploits have long engaged the interest of scientists, philosophers, mathematicians, and engineers. Not the least among these artisans are the orb-weaving spiders. Here are creatures endowed with instinctive skills that approach the borderland of planned and reasoned constructive abilities. The geometric precision and symmetry of their webs (at least to the uncritical eye) is a most amazing achievement. All this is accomplished without benefit of tools other than appendages that are part of their anatomy; and still more astonishing, the materials for these fabrications are drawn from their own bodies.

Master spinner among these arachnids is the Golden Lady, or Orange Garden Spider, *Miranda aurantia*. Not only does this spider

make one of the largest and most spectacular of orb webs, but the female also creates an egg cocoon that is a masterpiece of silk-spinning

art. The web may be as much as two feet in diameter and supported by a cable several yards in length. There are approximately 21 rays,

The Golden Lady

When the Orange Garden Spider spins her web in your backyard and cradles her eggs for the winter, her unlearned artistry taxes our capacity to comprehend instinct

By HUGH SPENCER

Photographs by the author

or spokes, in the web and a spiral band of 30 or more turns.

Silk is a complex protein colloid that hardens immediately when drawn out of the spinnerets. From the three pairs of spinnerets on the underside of her abdomen, Miranda can produce silk of several kinds to meet the need of any emergency. She makes strong and quite rigid silk for the framework of the web; a composite line of sticky, elastic silk for the spiral net; broad bands of silk to swathe the unfortunate victims that fall into the net; and silk often so fine that it is almost invisible to the human eye yet strong enough to support the weight of the spider as it goes about its activities on the web.

The home of Miranda may be in the garden or in open fields or brushlands, wherever insects abound and there are weeds and shrubbery to support the web. The web is usually built in an open space not far from the ground, where there are low-flying insects such as moths, grasshoppers, flies, bees, and wasps. It is here that Miranda keeps open house and welcomes insects large and small at a banquet from which they will never return.

The large orange and black spiders with bloated abdomens that we see in midsummer are females. The males are puny fellows who may lurk in the outskirts, awaiting a chance to court the lady. Both before and after wooing her, the male is in danger. After the nuptials he may be treated like any other guest and be devoured.

It is sometimes hard for us to believe that spiders, like all the lower animals, are creatures of instinct, that they do not think, reason, or plan; for the construction of the web has every appearance of careful study and design.

In order for a successful web to be completed, the site must be in an open space large enough for the intervening structure and free from obstacles. Actually the spider cannot "select" the site for a web and must rely on haphazard air currents to carry the bridge lines. The spider

"rejects" unsuitable sites, "accepts" any one that fills "minimum" requirements.

The first step must be to establish a bridge across the top of the space to be occupied by the web. In many cases it would be impossible for the spider to carry a dragline from one side to the other of this gap. Miranda then climbs to an elevated position, raises her abdomen, and spins out a strand of silk which floats, like a kite, on the breeze, until it reaches a solid support to which it will adhere. Scientists insist that this procedure is all by trial and error. The spider's sight is so poor that she could not possibly see the limits of the web she may ultimately build.

Once the line is established, the spider draws it taut, makes it fast, and then reinforces it by crossing back and forth to build it up with added strands and guy lines. From this beginning, a rough framework is constructed encompassing the area to be occupied by the web. Bisecting this area vertically, she next draws a line on which a center can be established as the focal point from which the rays of the web will radiate. Can a spider count or measure? Certainly not as we do. Hers is a mechanical action governed by leg-lengths, tensions, and the like.

From the center, several spokes are added, first on one side and then on the other, to insure maintaining the symmetry of the web. Finally the remaining spokes are added with approximately uniform spacing. During the placing of the radials, a small mat of silk is started at the center of the wheel. This will form the resting place—the home plate, so to speak—from which most of Miranda's operations will take place when the web is completed. The number of rays varies greatly in different species of spiders but

is fairly constant with any one species. There are usually about 21 in the webs of the Golden Lady.

Once the spokes are established, a temporary spiral of dry silk is put in, starting near the center and extending part way to the perimeter of the frame. Then, beginning near the border, the permanent viscid spiral is put in by the process of going round and round and attaching the thread to each spoke of the wheel. This spiral does



➤ SHE RESTS head downward on the hub. A portion of the zigzag band of silk that is sometimes called a "signature" is seen at bottom



▲ HERE MIRANDA is making her egg sac, which at first looks like a satin purse swinging from the silken strands she has laid down

▲ SHE ENVELOPS the ball in silk, drawing the material from her spinnerets with her hind feet and fluffing it into a woolly blanket

not extend to the center but ends far enough from the hub to leave a space through which the spider can retreat whenever such action is necessary. The temporary dry spiral is removed during the laying of the final lines of the web. As a finishing touch to her work of art, Miranda usually, though not always, adds a "signature." This is a broad, zigzag band of silk below the hub. It is sometimes called the "winding staircase," sometimes the stabilimentum, or stabilizer, though it probably does not act as a stabilizing device. The framework and the radials, as well as the hub of the web, are composed of firm, dry silk, whereas the spiral network consists of sticky, elastic strands. On close examination, the latter are disclosed to be dry fibers bearing minute globules of viscid substance.

Many spiders lurk in a retreat near the web and keep track of events by means of a trapline. Miranda, however, prefers to remain on the web and rests, head downward, on the hub, awaiting whatever grist may fall into her snare. The unfortunate victim that does arrive is quickly dispatched by a

swift jab from the fangs. Then it is rolled in a shroud of silk, dragged into the dining room, and drained of blood. After the meal is finished, the carcass is cut loose and tossed from the web.

It is in the making of her egg sac that Miranda creates her masterpiece and demonstrates her skills as a craftsman in silk. As summer draws to a close, her intuition warns her to prepare for a "blessed event," an event that will in fact be a multiple blessing. At this time she abandons her web and her weaving industry and turns to knitting. In a sheltered spot among the shrubbery, she builds a scaffold and hangs upon it a little basket of silk, a satin purse swinging like a hammock among the ropes. Into this dangling cradle, which is about the size of a pea, she maneuvers her several dozen eggs. She then seals the bag with a cover of silk. Her next act is to wrap the precious bundle in a warm blanket of felt. Like the "daring young man on the flying trapeze," she goes round and round on the egg ball, which now hangs like an inverted balloon suspended by a short cable. She spins

out yards and yards of gossamer threads from her spinnerets and fluffs the material up with her hind feet to form a matted layer about a quarter inch thick around the central sphere.

It might seem that these prodigious labors would have drained her silk glands to exhaustion, but there is more to come. The silk mills are now brought to maximum production to manufacture a protective cover for the cocoon, which gives it a size almost as large as an English walnut. Continuing her gymnastics on the ball, Miranda plasters it with a paper-thin sheet of silk, a parchment-like coat which will protect it from rain and inclement weather through the winter to come.

Endowed with instincts acquired through ages of evolution, Miranda has reserved enough of her precious building material for the last act in this amazing drama. So far, the ball has been suspended only at the top and can be stirred by every breeze and blustering wind. With her remaining resources, Miranda anchors the sac with many stays and braces. Finally it is trussed and



▲ PUTTING ON the finishing touches. As the egg sac nears completion, it approaches the size of an English walnut

▲ FINAL INSPECTION. The last covering Miranda gives it is a paper-thin sheet of silk, a parchment like coat to protect it from the weather

ried securely, a silken cradle hanging in safety among the surrounding weeds and bushes.

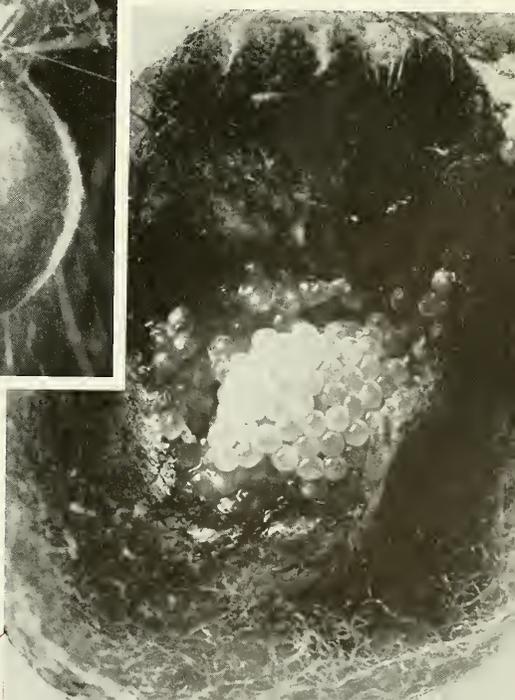
In the achievement of this miracle, Miranda has drained her vitals; her abdomen is an empty bag. She is an old woman whose purpose in life has been accomplished, and her days are numbered. She will never see the little ones that she has been at so much pains to provide for, nor will they know anything of the mother who has done so much to provide for their future. The following spring, the youngsters will force their way out of the sac to begin their season of spinning, weaving, and insect-trapping in the garden.



◀ MIRANDA DRAINS HER VITALS in building this silken cradle for her eggs, but she still has enough silk left to anchor the sac with additional stays and braces

Miranda's acts in this amazing drama are the acts of instinct; she neither makes, nor can she consciously alter the plan. The pattern of her behavior is dictated by the laws of heredity and is carried out in orderly sequence as the influence of season and environment affect her responses. The fabrications thus achieved are a truly unique and extraordinary example of skills and accomplishments in the world of animal life.

➤ INSIDE THE SAC are the eggs she has done so much to safeguard. She will never see her own young, nor will they know how much she has done to provide for them

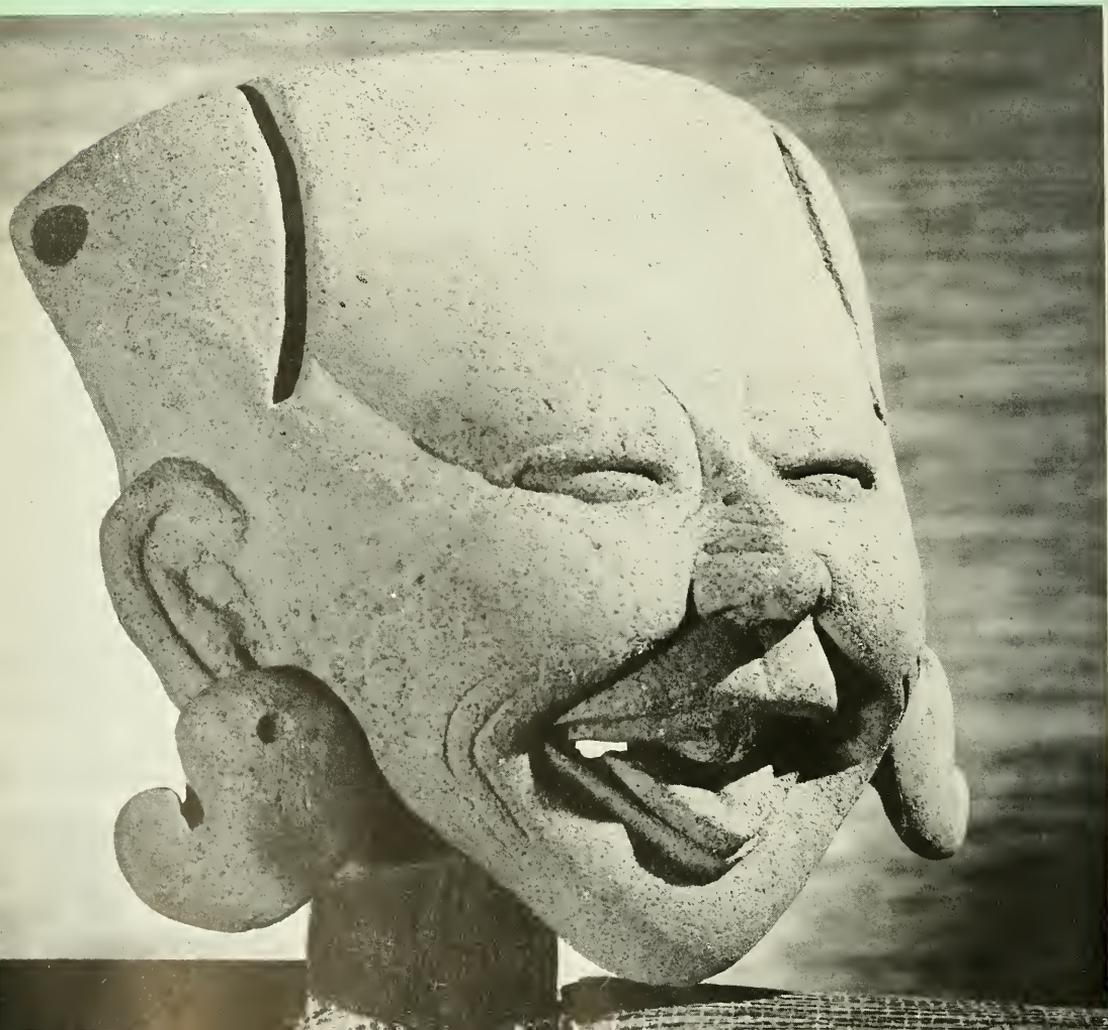




WOMEN WARRIORS and

◀ A WOMAN WARRIOR, with shield, ear ornaments, necklace, and waist decoration. It remains a mystery why the Spanish conquerors, coming not much later, seem to have found no female fighters in this area

▼ ONE OF THE HUNDREDS of Smiling Faces found in the newly discovered site in the State of Veracruz. Note its symmetry, simplicity, and the charm of its expression



Figures recently excavated in Mexico express a lightness of spirit rare in primitive art but hint that the women may have been expected to go to war

Laughing Faces

By FREDRICK ALVIN PETERSON

*Photographs by the author,
Courtesy of the Wenner-Gren Foundation
for Anthropological Research*



▲ THE HEADS really had bodies, separately molded. Note the head slits, possibly for the escape of steam during baking

GREAT temples and inscribed stones are not usually the reward of the archaeologist in Mexico. More often he has to content himself with broken pottery, bits of bone, or other unimpressive relics left by the ancient people. But each one dreams of finding something not only important but of great public interest. Such a dream was recently realized in the State of Veracruz by a young archaeologist named Alfonso Medellín Zenil.

Medellín obtained news of illegal excavations by commercial pot-hunters at a place named Dicha Tuerta in the Municipio of Tierra Blanca. By good fortune he arrived at the scene before the site was completely sacked. He was also able to locate a near-by site, known as Los Cerros, which had been overlooked by the looters. He wasted no time in removing everything he could find in both places.

Out of these excavations came some of the most charming of all the figurines found in Mexico. They were well known previously as "Smiling Heads," "Laughing Heads," or "Caritas Sorrientes," but not much else was known about them. Approximately 1000 of these baked clay figures were recovered

here. Previously only about 50 had been known.

The places that were dug up appear to have been rubbish heaps accumulated in an area where the figurines were being made and fired. This supposition is based on the fact that all the pieces are of baked clay, all are broken, and all are found in enormous profusion in a relatively small area. Further, no stone artifacts were found, which supports the idea of a rather specialized refuse heap rather than a general one near a habitation.

The Smiling Heads are not just heads; they definitely belong to corresponding bodies. Previously some authorities thought that the heads were made to insert in walls as a kind of decoration, because they had a tubular extension at the base. However, the head and the neck were made separately and both joined later to the body. The neck attachment for the head is reinforced, and that is why they usually break farther down at the shoulder.

The Smiling Heads present a grin, a vacuous smile, a sardonic leer, or a laugh. They are very realistic and may represent actual portraits of the time. It has been suggested that they represent a

deity called Macuilxochitl, Five Flower, who is a manifestation of a major deity called Xochipilli. This god represents love, flowers, games, songs, dances, plastic arts, gamblers, and nobility.

The peculiar profile of the heads is due to cranial deformation, a process performed by these people during infancy.

These figurines are mold-made and are all hollow. The front part of the head was cast in a mold, as is evident from the many finger marks left by the potter when he pressed the clay into the mold. The figurines were built up in sections, with expertly smoothed joints. The arms were applied separately. The characteristic position is with the elbows straight out from the shoulders and the forearms pointing straight up. The hands are delicately formed.

The shape of the head varies from triangular to ovaloid, with some almost rectangular.

Generally two round air holes were left on the side of the head near the top, as well as slits in various positions around the head. These openings may have been made in order to let the steam out of the hollow figure when it was being baked, so that it would not



◀ AN EARLY TYPE of Smiling Face. Apparently the people filed all but their two front teeth. Note the elaborate chest band and loincloth



▲ THIS SMILING HEAD wears a Victorian-appearing headdress, with dangles

crack. The body often has air-escape holes in the middle of the back, either triangular or round.

The teeth are always well modeled and in most instances show evidence of tooth-filing. The usual form was to leave the two front incisors or portions of them long but to file down the rest of the teeth. The tongue often protrudes slightly between the teeth, presenting an irresistibly charming

picture. Dimpled cheeks are common, dimpled chins less numerous. Around the nostrils there is often a peculiar modeling, forming a crease that joins with the cheek dimple. Some of the faces have smile-creases at the corners of the eyes. The ears are realistic though sometimes very elaborately formed. Almost all have ear ornaments, which may be round, leaf-shaped, or in the form of a "tiger claw."

These ornaments were hand-modeled and stuck on to the mold-made head before it was baked.

The eyes in the early heads are oval, but in the later and more classic ones they have a realistic modeling and an upward slant toward the outer edge, giving them a more Mongoloid appearance.

The figures often wear chest bands with elaborate geometric decoration. Most of the men wear

► IT IS IN FOREHEAD DESIGNS that the figures show their greatest distinction or personality. This one carries the design of a monkey



▲ HERE WE SEE as a frontal decoration a waterbird, possibly a heron in the act of catching a fish

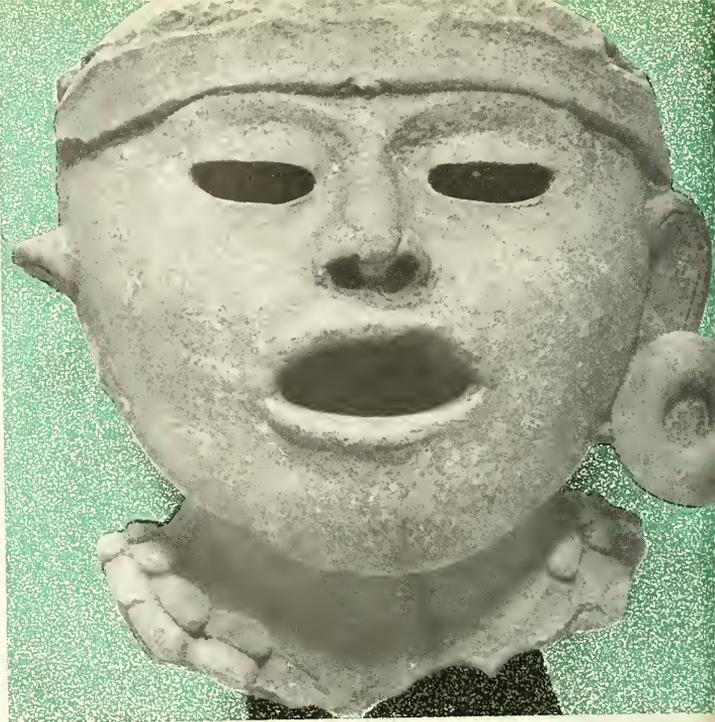




▲ THE FIGURES WERE PROBABLY PORTRAITS OF ACTUAL PERSONS LIVING AROUND A. D. 800 AND SHOW THE HEAD DEFORMATION CUSTOMARILY INDUCED BY THESE PEOPLE DURING INFANCY



▲ SITUING the peculiar position of the head. The characteristic position of the body is with feet apart and flat on the ground, buttocks pushed backward, and the chest slightly concave. Sometimes the abdomen is protruding or sagging.



▲ A POWERFUL SCULPTURE, probably representing the God of the Flayed Ones, Xipe-totec. In portraying this god, a human being was sacrificed, and a priest wore the victim's skin, inside out, in a prolonged dance. The lumps of fat around the neck, visible here, are the conventional sign of this gruesome ceremony

ornamental breechcloths, although some figures were noted to be nude. The female figures are much more modest; all appear in skirts. However, not all wear a waist covering, and they sometimes show virgin-like breasts.

Almost all of the figures wear necklaces, which seem to have represented stone beads, probably of precious material. These are either spherical or round and long. The necklaces may bear pendants, either plain and round or ringlike. One skull pendant was seen.

It is in the ornamentation of the forehead that the figures take on the greatest distinction or personality. This ornamentation varies greatly. There are designs on the forehead, either running the full width of the head or only covering certain sections, in geometric, symbolic, or voluted form. There are

designs of monkeys, herons, fish, herons catching fish, snakes, lizards, deities, and jaguars. The geometric patterns include scrolls, triangles, circles, stepped-frets, and various

interlaced designs. The ornamentation was often freshened or sharpened by means of incised lines made before firing.

Traces of red, white, and black

This tentative time chart presents the approximate position of the Smiling Heads in relationship to other areas of Mexico.

VALLEY OF MEXICO	CENTRAL VERACRUZ	CERRO DE LAS MESAS	TRES ZAPOTES	PANUCO	MONTE ALBAN	MAYA ZONE
Teotihuacán IV	(Las Cerras II) Remojadas Superior II	Inferior II	Superior	Pavón IV	III b	Tepeu
Teotihuacán III	(Los Cerras I) Remojadas Superior II	Inferior I	Middle	Pavón III	III a	Tzokol
Teotihuacán II				Pavón		
Teotihuacán I	Remojadas Superior I			Pavón II	II	Chicanel

The period termed *Remojadas Superior I* belongs to the *Early Classic* horizon of Central Veracruz. It is characterized by small Smiling Head figures, rather crudely made, in the form of whistles and rattles, with much appliqué ornamentation. These have been found at the archaeological sites called *Remojadas* and *Loma de Los Cormanos* in Veracruz.

In the epoch styled *Remojadas Superior II*, or *Late Classic* horizon, two phases have been distinguished. The earlier is termed *Las Cerras I* and includes two types of Smiling Heads. These have facial features closely grouped on a smooth, almost flat surface, oval eyes, wide heads, and either simplicity of, or a complete absence of, forehead ornamentation.

The characteristic types of the most recent phase of *Remojadas Superior II*, which is called *Las Cerras II*, are distinguished mainly by the elaborate forehead ornamentation. They are also characterized by fullness of smiles, realism of forms, classic simplicity of features, oblique eyes, and dynamic postures.



▲ ONE OF THE EARLY TYPES of Smiling Heads. Notice the hand raised as if to stifle a laugh



▲ ANOTHER WOMAN WARRIOR, with studded headdress

▼ THIS IS ONE of the figurines from the Maya region, brought in ancient times for trading purposes to the region of the Smiling Faces. It proves that the two cultures flourished at approximately the same time



paint has been found on the figures, so that we can partially reconstruct them in their original bright colors, which were painted over a bath coat of white or reddish-orange.

The Smiling Heads are more numerous than the Women Warriors, and the series also includes babies in cribs, death gods, harvest gods, flower goddesses, rain gods, jaguar and coyote warriors, monkeys, jaguars, turkeys, turtles, toads, and fish.

The Women Warriors present a feature new to Mexican archaeology. They are veritable Amazons, bare-waisted, serious-faced, carrying shields, and wearing huge studded headdresses. The shields are decorated with elaborate scrolls.

The most terrible of all the Mexican deities is also present here—Xipe-totec, the harvest deity. In his honor a victim was sacrificed. The victim's skin was peeled off and placed over the body of some priest-dancer. This priest wore the skin all around town, dancing as he went, for four or five days, until he could no longer endure the stench. This sacrifice is supposed to represent the husking of the green corn, the peeling off of the skin of the victim being symbolic of the husking ceremony.

It is sometimes difficult or impossible to tell where the Women Warriors leave off and where Xipe-totec begins. Many of the Women Warriors have open mouths and

continued on page 239



▲ PALM CANYON: a delightfully cool refuge in heat. It is near Palm Springs, California, in the Colorado Desert. For hundreds of years, the Agua Caliente

Indians have made their home here. Five thousand specimens of our only native palm survive in this oasis, watered by this fine stream from the San Jacinto Mts.



▲ MOUNT SAN JACINTO and Willis Palms Oasis. Here beneath a 10,000-foot range, which retains its snowy robes into the warmth of spring, we find the tropical luxuriance of native palm trees

Our *Palm Oases*

Once they were Gardens of Eden to a prehistoric people; today they are breathless reminders that the desert has two faces

By JOYCE ROCKWOOD MUENCH

Photographs by JOSEF MUENCH

THE white man has been a long while learning to appreciate the desert. The early Spanish explorer in search of the Seven Cities of Cibola, and the Forty-niner after him, could see no beauty in its great expanses, its chiseled moun-

tain barriers, and dry washes. They made the name a synonym for thirst and hardship, claiming it was waterless and inhospitable. Thus scorned, the desert, a land of passionate extremes, seemed to live up to its reputation with a vengeance.

Even now, when we know better, the desert must be wooed with circumspection, and her many wonders are yet to be fully appreciated. Most of us are aware of how charming her spring smile can be. At Palm Springs and an increasing



▲ NEAR the limits of the ultrasmart winter resort of Palm Springs, Mount San Jacinto is seen framed by the graceful palms

number of other choice spots, desert winters spell holidays, informal or luxurious, according to one's taste. To other parts, irrigation has brought gardens on a commercial scale, with bountiful and numerous annual crops within sight of snowy mountain crests.

But would you risk "double or nothing" on the question: "What kinds of forests will you find in the desert?"

"Joshua trees," or "Saguaros," might win you the jackpot, but there is another kind, ancient and shady, filled with birds and night-time animals, and there are even nooks of ferns along boisterous

streams that explode into waterfalls.

Don't expect a Sherwood Forest or the tall pines of the Northwest. These are forests of palm trees, hundreds of years old, set in the only oases on the North American Continent.

There are more than 100 palm oases in the Colorado and Mojave Deserts of southern California and western Arizona, with stands numbering up to 5000 trees. Each is an isolated island of charm, tucked away in a canyon cut into a stark mountain or foothill area.

If you are a stranger to them, a new experience awaits you. You

must leave the main thoroughfare and head for the hills to meet the legions of *Washingtonia filifera* at home. Often you can drive the car right in among them. Even in summer, when the surrounding desert may be breathlessly hot, a refreshing breeze comes rustling through the fronds, bearing a welcome that has a touch of moisture. Overhead the crowns of green shut away the sun, and the desert silence comes alive with the songs of birds. Hundreds chatter and sing, flying from one tree to another as though in perpetual surprise at finding such a delightful haven.

Where wind has stripped off the dead leaves, the bare boles are very tall and slender, some soaring to 40 feet or more before the intricate patterns of fronds intersect each other. Fires rake the trunks, too, leaving them velvet black and gaunt. When no flames have conspired against the palms, they cling modestly to their "skirts." Year after year the accumulated leaves gather, forming a waterproof thatch. Never completely still, the dry voices of a hundred rustling palms, joining the winged chorus and perhaps a rushing stream from the mountains, make a tremendously impressive effect.

As soon as the visitor walks into this strange forest, his own footsteps waken branches that carpet the ground, and he becomes part



of their weird, triumphant song. Since the canyons are irregular, with trees set on the slopes and crowding narrow valleys, the sound comes from everywhere to envelop the intruder. It is not entirely unlike the swelling of a great organ, fill-

ing the great spaces in a cathedral.

Birds are not the only native inhabitants in the forests, although you must be there at night to meet the rest of the family. All the denizens of the Lower Sonoran Life Zone are apt to promenade on the

way to dinner: the jack rabbit, kit fox, kangaroo rat, whitefooted and pocket mouse, not to mention a possible cougar or desert mule deer.

The palm tree, lord of the oases, spells the difference between sunbaked, lifeless canyons and a desert

▼ **STURDY ENOUGH** to survive climatic change, the graceful palm may be bent almost to the ground but rise

again. This luxuriant growth is to be found in the oasis of Palm Canyon National Monument





◀ **WILLIS PALMS:** an attractive oasis on the edge of the Coachella Valley in Southern California. In this wild garden spot, the native palms grow luxuriantly and make a fascinating retreat from the warmth of the desert

▼ **SCARCELY THE KIND** of a place that one expects to find in a desert in California. In front of the figure, young palms are springing up, promising that the grove is not on the decline

Shangri-la. It was here long before man wandered on the scene. Like the massive sequoias of coast and Sierra, it has outlived its time, for it was born in an earlier age. But while the northern giants started life in the wake of melting glaciers, *Washingtonia filifera* seems to have grown in tremendous forests around the edge of ancient Lake Cahuila, a former arm of the Gulf of California which became landlocked thousands of years ago.

The sea itself has disappeared, leaving a plainly marked shoreline on the slopes of the Santa Rosa Mountains. As you travel through the Coachella Valley, the white strip is more conspicuous than the oases, to which the palms retreated as the water evaporated in a progressively drier climate. You must know just where to look to spot the mere pencil-brow lines of trees on brown slopes, the outposts of these last stands of a forgotten era.

They rim the huge sunken basin, which has now been invaded by the date palm, imported from Africa. These newcomers stand where the ancient forests once did but lined up as though for continual inspec-



tion. Pampered and cultivated, with brown coats tied to their ripening clusters of fruit, they are not to be confused with the hardy old veterans and their offspring, who must shift for themselves in canyon clefts.

There were Indians living in the forests around Lake Cahuila. We know little about them, but their stone arrowheads and other crude artifacts are still found there. Their descendants, now in broken groups, occupy small reservations in the desert, and the scattered bands of palms will probably outlive even

these. The trails of these Indians wind among the oases on which they depended for life. The palms provided fruit for food and fiber for baskets and crude shelters. From arrowweed that still grows around the springs, they made arrows and hunted animals coming for water. The Indians are reputed to have set fire to the "skirts" of the trees periodically to increase the yield of fruit, and sometimes a particular tree belonging to some family was burned down at the death of an important member to provide



(Right and below) THE DRIED SKIRTS formed of the fronds of former seasons clothe the stately trunks below the newer growth



▼ IN PALM CANYON, groves of our only native palm (*Washingtonia filifera*) are nurtured by the melting snows from higher elevations. The canyon is owned by an Indian tribe whose ancestors have lived here for hundreds of years



him with food on his way to the eternal hunting grounds.

No one bothers to gather the fruit of the palms any more. Most of the oases are seldom visited, but each one seems to have a name. Prospectors and "desert rats" who used them as steppingstones in their wanderings seem to have relied chiefly on numbers. There is Twenty-nine Palms, with a desert resort growing up around it, headquarters for the Joshua Tree National Monument; also Forty-nine Palms, and Thousand Palms. You will even find "No Palms" on the map.

Because the most talked of among the oases is merely "Palm Canyon," many people assume that it is the only one. Fortunately, that is far from true, but if it were, we would



still see in a capsule what the wonderful widespread forests of palms must have been in their prime. This very special oasis belongs to the Agua Caliente ("Hot Water") Indians, as does much of the ultra-smart desert spa, Palm Springs; and the tribe has lived there for some hundreds of years. They have moved out of the exquisite canyon itself and now merely man a toll-gate and operate a little refreshment stand at its mouth.

Palm Canyon reaches into the San Jacinto Mountains for some fifteen miles. More than 5000 trees line the walls and stand in the water of a stream that grows to a boiling torrent when snow melts on the higher slopes. Well-frequented picnic areas are scattered in the shade of the palms near the mouth, but farther up the narrowing gorge, the oasis is still wild and mysterious. Big boulders block the stream, forcing it to leap into swirling pools. Trails that follow the water as long as possible finally start to climb higher, then peter out as the rugged walls discourage all but the most ambitious.

Not far away are Andreas Oasis and Murray Oasis, each in a canyon tributary to Palm Canyon. In Murray, almost 1000 trees crowd into an area about 4 miles long, and some of the palms are believed to be at least 250 years old. Visitors report catching glimpses of wild sheep that have wandered into the secluded oasis from the Santa Rosa band of bighorns. The band is slowly coming back from near extinction in a preserve on the north slopes of the Santa Rosa Range.

At Dripping Springs in Santa Rosa's Fern Canyon, a mile and a half parade of 500 palms marks a moist spot, unexpected and perennially delightful, as the name suggests.

Scattered through the deserts are Pushawalla Oasis in the Indio Hills and Hidden Springs in the Orocopia Mountains, the latter a dozen miles from the town of Mecca and with only fifteen trees. In Borrego Palm Canyon, nearly 800 trees grow, and as far away as the Kofa

Mountains in Arizona's Yuma County, we find Kofa Palm Canyon. In this remarkable place the palms have clambered right up into the tremendous block of volcanic rock, and although there is seldom any running water, they get enough moisture from a deep cleft to sustain life in about 65 trees, some of them lodged in a high crevice that calls for quite strenuous climbing.

Thus, from almost sea level to more than 3000 feet above it, the oases are to be found, no two quite alike except in their atmosphere and unique song. What binds them together is the palm tree itself. While utterly different from the big sequoias, it shares with the latter a dignity in belonging to another geologic age. An unquenchable life has seemingly enabled them to both outlive a change in climate and a race of men.

To do this, the palm tree must be a remarkable plant. A mature palm weighs tons, but the trunk is so flexible that it sways in the heaviest of winds and seldom breaks. Belonging to the group commonly called Fan Palms, *Washingtonia filifera* often reaches 75 feet in height. The leaves are from five to six feet long and almost as broad, counting the many folds. On the margins are the long threadlike fibers used in basketmaking.

Thousands of tiny rootlets, about the size of a lead pencil and not more than six inches long, thread their way among the rocks, close to the surface, gathering moisture for the porous bole. Instead of showing annual growth rings as most trees do, the palm increases its girth by expansion of cells through the entire diameter. It puts out new leaves at the top, while the older fronds lose their capacity to manufacture food and drop limply down on the trunk. There they remain for years unless torn off by winds or burned. Sometimes the sheer weight will break off a "wall" of them, leaving an irregular gaping hole on the side of the tree. There is probably no sound quite as dry as the movement of wind among these thoroughly dehydrated

"skirts" or the rustling of them underfoot on the ground.

The tree grows very slowly, while the carpet of cast-off petticoats gradually crumbles away and is absorbed into the soil.

Don't expect the oases to be neat, tidy parks. Rather, they have an adventurous air, a perfect background for gaily-colored Bedouin tents and romantic happenings, as several Hollywood movie companies have found. Except for the problem of a food supply, one could imagine holing up in one of the more remote canyons they guard, undisturbed by the world. There are years between visits to scores of them, and abandoned campfires and tumbled-down shacks hidden among the palms suggest that they have been used for just such retreats.

What delights they offer can be pointed up by a visit to Willis Palms, on the edge of the Coachella Valley. A neglected road leaps up from the desert floor, escorted to a hilltop by an avenue of shaggy trees. Fire has bared and blackened some of the trunks, and they stand in graceful groups, framing a dozen splendid views of the San Jacinto Mountains across the valley. The first rays of the morning sun catch the more than 10,000-foot peak and turn it to lovely tints against the black silhouette of the trees.

The leaves, moving in a continual pattern of sound, seem to be recounting the history of the desert. Perhaps if you were to stay there long enough to learn their language, you would hear the whole story of the ancient inland sea and learn how the palms were driven back, with their dwindling Indian dwellers, into the canyons.

Perhaps the young trees, fresh and green and hopeful, would put in their word. Hearing talk from enthusiastic visitors, they could prophesy that before long, many of the oases may become parks, so that coming generations can enjoy their unique tranquility.

Surely the palm oases, unique on the continent, have a future as well as a past.



▲ **READY TO GO OVERBOARD.** The faces made them feel more comfortable under water against dangers from behind

Exploring

Bahamian Reefs

Further vacation adventures of the Diving Criles, who donned flippers and diving masks to learn about some of the mysteries that lie beneath the sea

By **JANE and BARNEY CRILE**

Photographs by the authors

Part II

THE two-hour sailboat jaunt that turned into a thirteen-hour voyage brought us to the colorful little settlement of Fresh Creek on the north coast of Andros Island, in the Bahamas. When we dropped anchor, we knew that exciting diving experiences lay ahead. Hereabouts we would find the crystal-

clear waters we had come so far to explore. What would we encounter in the ominous Blue Hole that Captain Joe had told us about—"de Blue Hole dot goes down to de bottom of de world?" What dreadful creatures—or would we dare to go into it at all?

Most of the population was at the

dock to meet us. There was an air of expectancy, and the crowd jostled, whispered, and giggled with suppressed excitement. Women and children held bunches of flowers behind their backs and shyly presented them as I stepped ashore. Smiling and laughing, they led us up a path of dazzling white





▲ ANN AND JOAN on a native dinghy at Andros Island in the Bahamas

▼ GEORGE and a group of native children show us the tin can and bottle treasures they have raised from inshore waters



▲ THE CRILE AQUA-TEAM ready for action in their bright yellow jerseys and ballet tights



coral dust lined with pale pink sun-bleached conch shells.

Marco Polo was no more wonder-struck at the splendor of the court of Kubla Khan than we were when we saw where we were to live. It was a new and beautiful house of coral, freshly painted pink to match the conch shells. "Harbor View" was written over its door. The people jammed around us, watching our faces to see how we liked the house. We were to be the first who had slept in it. It was obvious that we approved and they were

elated. White teeth flashed, and the children jumped up and down, clapping their hands.

The house was a conspicuous example of the talents of the gifted Clare family, which dominated Fresh Creek. It had been built by Randolph Clare, the successful photographer in Nassau. His father and mother were the patriarch and matriarch of the island, his uncle was the deacon, his cousin, the constable. His fifteen-year-old brother, David, was an eager young artist.

David and his chum Ivan became

our special friends and diving companions. David was a smart, slim boy who had spent many of his fifteen years in bed with osteomyelitis, where suffering and forced inactivity had accentuated natural intellectual and artistic talents.

His friend Ivan was a black Adonis of sixteen, tall, broad of shoulder, with fine long muscles and perfect co-ordination. Adventurous and fearless, he was a creature of nature and the only one of the natives who did not instinctively fear the water. With the pride of British subjects for the Royal Family, he told us that his brother was valet to the Duke of Windsor.

Dave and Ivan, so opposite in interests and accomplishments, regarded each other with deep respect. Their common ground was in wit and humor, which both shared. They asked us to come with them to fish for cowfish, that curious travesty of a fish, which, like a lobster, wears its bones on the outside, and whose white meat is packed and protected in a hard tri-

angular box of shell. Ivan with a spear and David with a pad of drawing paper joined our crew.

A strong wind was blowing in from the Tongue of the Ocean, the mile-deep trough that bounds Andros on the north, and the waves were breaking white on the outer reef when we set out for the flats.

"Tartendeheadbaa," Captain Joe yelled on each tack, as the boom swept across our heads. This was in the mixture of African, English, and Caribbee in which the natives communicated with one another and meant "tuck your head down." We could not understand a word they said to one another.

After innumerable tacks, we rounded the rocky headlands of Fresh Creek and entered the broad channel between the barrier reef and the island. We anchored the "Progress" at the edge of the flats, put the dory overboard, and sculled into shallow water filled with the wobbling tails of bonefish, the flapping wings of batlike rays, and the fins of sharks.

Ivan ran down a four-foot nurse

shark, caught it by the tail, and carried it triumphantly back to the boat, its tough brown body writhing, wrinkling, and squirming in the air. Clad only in electric-blue bathing trunks, Ivan gleamed like polished ebony against the white clouds—a Winslow Homer painting of "Bahamian Life."

With flippers on our feet, face plates over our eyes, and canvas gloves on our hands, Barney and I lay down in the soupwarm water and pulled ourselves along the bottom to see every detail of the teeming life of the flats. The shallow water was an ocean in miniature, where hundreds of tiny brightly colored fish no longer than a thumbnail played in little fist-sized clumps of branching coral. The life here was as teeming and as colorful as on the deep reefs, but it was all so small that it was invisible from the surface. A minnow-sized black demoiselle living in an empty conch shell ferociously protected her home against all comers and even attacked us. Baby lobsters and crabs scuttled for shelter beneath

the sponges and seaweed. This was Neptune's nursery, and the sea children were so small that we had to put our faces right up to the windows to see them.

There were conchs on the bottom, green and mossy on the outside, but on the inside fresh and rosy as though newborn from the sea. Even in the fortresses of their shells, the conchs were not safe from marauders, and we were witness to a gruesome example of marine cannibalism. A huge horse conch had overpowered an eight-inch queen conch. The giant cannibal exuded half his body from the shell and engulfed his victim in awful scarlet folds of crawling flesh. He sucked the still struggling queen from her shell and devoured her alive.

Captain Joe was leaning over the side of the dinghy, snagging conchs off the bottom with an iron hook lashed to a wooden pole. With a deft blow of a hammer, he knocked a spiral off a conch shell and, inserting the narrow blade of a fish knife, cut the animal's attachment to the shell. Then, with a gentle twist, he pulled out the conch,

▼ THE WATER was so warm there was never any discomfort. the bottom an inexhaustible panorama of brilliant undersea life





▲ ONE of the younger Criles voyaging on a turtle's back

sweeps. We felt sorry for it when Ivan pulled it out, because it had a brightly colored, almost human face, with soft thick lips that seemed pursed for either a kiss or a whistle. But the rest of it was like nothing we had ever dreamed of. It was as though an ordinary fish had been put in a triangular box that was too small for it and left the nose, fins, and tail sticking out. There were two little openings for its eyes, one for the mouth, one for the anus, and one for each fin. The hind part of the hard chitinous shell changed imperceptibly into a soft movable tail. Painted patterns, stripes and dots of brown and blue, were continuous from nose to tip of tail. Two little horns over its eyes give the cowfish its name, but the pursed lips through which it jets water to uncover food in the sand look more human than bovine. Ivan caught cowfish, one after another,

as fast as he could rebait his hook. "Wait till we bake some for you," he said.

Eating is fun everywhere, but in an insular community where there are no manufactured diversions eating becomes one of the main joys of living. Dellie and Eliza, the two attractive girls who came with the house as our "personal servants," worked unremittingly all day, doing what, we never knew, but spending most of their time in a thatch-roofed hut preparing food. This was the more extraordinary because we ate almost nothing for breakfast and munched Uncle Herman's bannock on the reefs at noon. But the native dishes that simmered in great iron pots over slow-burning fires took long hours to cook.

Most unusual was the white meat of Ivan's cowfish, cleaned, ground, mixed with tomato paste, "sour and

threw the guts overboard, and cut the hard white meat in pieces.

"Have a bite," he said. We tried it and it was sweet, good, not too tough, and with a flavor like abalone.

"Dot is what de cowfish like, too," said Ivan, as he baited his hand line with a big solid piece. Then he fished up a prickly sea urchin, put it in a half coconut shell that was used to bail the boat, and pounded the sea urchin to bits.

"De cowfish come from everywhere when dey smell dis," said Ivan, and he dumped the black juicy contents into the moving tide. Barney and I submerged to watch the effect of this potion. Almost at once the first cowfish swam by, rigid in its triangular box, only its little fins and tail beating the water.

"There's one here," we cried, and Ivan threw his conch-baited hook in the direction of the cowfish. It seemed to be attracted by the splash, swam right over, and picked up the bait. Ivan jerked the hand line, and the fish was hooked. It was surprisingly gamy and zipped back and forth in long runs and

▼ PURPLE AND GOLD sea faus grew in solid masses over a rusted cannon



pepper," and then put back into the shell to bake. Many of these box fish are said to be poisonous, but natives that live by the sea know the edible fish. What they ate, we ate. Most delicious were the dishes that Dellie made from our Nassau turtle, fried, curried, and in soups. When I asked Dellie how she made the turtle soup, she giggled at the preposterous question. To her every one in the world would of course know how to make Fresh Creek turtle soup.

"Take lard," she said, "and flour."

"How much?" I asked her. At that she guffawed.

"One spoon and brown it deep and good. Den put in tomato paste and onion." By this time she was laughing so hard she could hardly talk. "A can of water," and tears were streaming out of her eyes. "Let it boil and put de cut-up wings of de turtle in, and de jelly from de neck." Here she gave up, doubled up with laughter at the utter incongruity of my ignorance.

The dish that brought a happy light of celebration into every native's eye, the "ice cream and cake" of the island, was their Coconut Jonny. "It so easy," they said. "Grate your coconuts, mix flour, two spoons of baking powder, a tin of milk, a cup of sugar, and bake. Den you have your Coconut Jonny."

The coconuts they ate in dozens

of ways, but of all the food in the tropics we loved fresh-picked young green coconuts best. Mr. Clare, with a single blow of a sharp two-foot curved knife, sliced off exactly the right amount of husk and shell to expose the trembling opalescent water. With spoons made from the pieces of the severed husk, we scooped out the soft coconut jelly, cool as the shade of the palm tree, and with just an innuendo of coconut flavor.

When Barney told Captain Joe it was time to dive on the barrier reef in the legendary Blue Hole, Joe moaned, "I know you'se water dogs, but don' dive wid dose creatures. Dem's terrible creatures."

It was this mournful reaction that gave us the idea of putting the horrendous faces on the bot-

toms of our ballet tights, seen in some of the photographs accompanying these articles. These snarling faces made of adhesive tape and lipstick would fool Joe's "terrible creatures." So, with spears in hand, bright green face masks on our heads, and flippers on our feet, we flapped down the coral path like ducks in a Walt Disney ballet. When the natives saw us waddling toward them, they smiled, then they guffawed. They pointed at us and beat one another on the back, but it was nothing to what happened when we turned to reveal our warning device.

"We'll take care of your creatures," Barney said. "If they bite us, we'll bite right back." Here he contracted his gluteal muscles, and the mouth of his painted posterior



◀ BARNEY exploring the bottom, with his spear gun

▲ ONE of the children dives down to help Jane with a speared hog snapper



face opened and snapped shut. There was a second of silence, a collective gasp, and the natives went wild. They rolled on the pier, they screamed, they shrieked with ecstasy, convulsed with sobbing laughter.

Soft trade winds filled the sail, and white cumulus clouds billowed on the horizon as we sailed out to the reef. It was a dazzling day, vibrant with the primary colors of sea and sky. There was the sound of wind in our sails and the mournful keening of the breakers on the reef. As far as we could see, and farther, majestic combers curled and crashed in rhythmic lines of dancing foam.

Joe anchored the boat inside the breaker line, but it still wallowed fearfully in the ground swell. As we looked down through the riffled water, we understood why the barrier reef is known to the natives as the Red Reef. The shapes of the coral masses seen through the water were a deep mahogany red.

"You sure you go in here?" Joe asked.

We were sure.

We felt small and lonely in the dinghy as Tom sculled us away from the boat and toward the breakers.

"Don't go no more," the skipper yelled to Tom above the boom of the surf, for he was afraid that Tom would scull us right into the breaking waves.

We told Tom to stand by as we got ready to go overboard.

The skipper had told us that at his island the corals were the most beautiful in the world, but we had never heard of the Red Reefs of Andros from anyone else. We did not know that for ten years the American Museum of Natural History had been collecting coral from this same reef to reproduce in exhibit form the most magnificent coral reef of the northern hemisphere. We were totally unprepared for what we were about to see. The roar of the breakers filled our ears, and spindrift clouded our face plates. Then we sank beneath the turbulence and the water washed

our vision clear. We were in a golden dream.

The bottom was golden sand that reflected each dazzling ray of sunshine. The breakers bent the mirror of the surface into rolls of molten gold and then shattered them into golden disks and dust. Clouds of golden bubbles drifted downward, as bright in the sunlit sea as the diamond drops of spray that had shot skyward from the waves above. All the water was alive and dancing in showering bubbles of gold.

At first the reef seemed bare and empty except for clouds of yellow grunts that hung like mirages beneath the coral. But as we swam closer, the coral came alive. A grouper poked his sullen head from a rocky cave; a brilliant bluehead, all azure and gold, swam inquiringly up to my lace plate. A little red squirrelfish gazed at us with its exophthalmic bug eyes, and a big parrot fish, as electric blue as Ivan's trunks, sailed by and began to graze on the coral.

There were two types of fishes in this reef—the grazing fishes, and the predatory fishes. Sometimes barracudas, the most predatory of all, floated quietly within a yard of angelfish that they could have swallowed at a bite. There was no obvious reaction to their presence and no withdrawal of the smaller creatures. Like prairie dogs, the little ones seemed to have taken careful stock of the situation and when danger approached, merely edged closer to the safety of their holes.

There were many kinds of parrot fish. The rainbow parrot has colors which in the air are as brilliant as the spectrum, but beneath the sea are muted and dominated by the vivid green of the fish's protruding beaklike teeth. There were big blue parrots, and pinkish ones that often, like the black angelfish, traveled in pairs. There were little enamel-blue parrots only six or eight inches long that drifted by in schools chaperoned by a parrot schoolmaster four times their size. What relationship existed between the tiny parrotfish and their leader we have never learned.



▲ JOAN, unaware that she is being photographed between di

There were many groupers on the reef, 30-pound black ones, striped ones, and red ones. Many of them changed colors like chameleons as they swam over the bottom. One big brown one became paler and paler and seemed to sicken and die as it lay motionless and tried to fade into the brightness of a patch of white sand. A trumpet fish, long and thin as a flute, stood upright on its tail, mimicking a sea feather in the background. Everything pretended to be something else, and unless we knew where to look and what to look for, we could see nothing but the over-all beauty of the reef.

We have read of the noises that fishes make under water, the little squeaks of the porpoise, the clicks of the snapping shrimp, but we have only heard three sounds made by creatures of the sea. One of these is the scraping of the teeth of parrot fish on the rock as they scratch nourishment from the coral, another is the clacking sound made

by the tail of an escaping lobster, and the last is the grunt of a frightened jewfish, or grouper. The noise of the lobster and that of the grouper sound much the same, except that the lobster's has a more nasal twang. The grunt of a grouper is low and guttural, like that of a pig, and when a big jewfish grunts, he booms like a bull moose and shakes the water. It is a paradox that although we have swum when there were more of the fish called grunts than there was water, we have never heard these fish utter a sound. Even in the ritual of their strange dance, when two grunts confront one another for minutes at a time with scarlet mouths gaping as wide as the fish is long, we could hear no sound.

We looked for an oceanic face of the reef, a spot where the coral plunged down into the darkness of the deep sea. But seaward the decline from the summit was as gradual as on the land side. Only where the reef was cut by deep channels

did we find high vertical cliffs that towered ten to twenty feet from the bottom. At these points, where the food-laden currents pour in from the sea, the coral supported multitudes of fish. Thousands of snappers hung in the branches of the coral trees, parrot fish, turbot, grunts, yellowtails as bright as buttercups, and a host of tiny sergeant majors made us feel that there was scarcely room for us in the water. Yet as we swam up on these solid masses of fish, they drifted dreamily apart, just enough to let us pass, and then closed again behind us to heal the breach without a scar.

These concentrations of fish always occurred in the most luxuriant parts of the coral jungles. The same soupy stream of plankton-laden water that supports the coral polyps feeds the tiny fish. Tiny fish support the larger fish, and the larger ones support others still larger in a never-ending cycle of carnivorous dependency. Yet only once did we see one fish eat another. It was at

high noon, when Barney saw a green moray grab a six-inch grunt and swallow it whole. Either fish do not feed when we disturb them or else they feed in the early morning and late evening when we are not there to see.

The boys, Ivan and Dave, were steeped in native superstitions about the dangers of the reef and at first they were reluctant to go into the water. As time passed and they saw us come up again and again unharmed, their confidence increased and their curiosity grew. We asked them to come in.

They hesitated, put on our extra face plates, and then gingerly let themselves into the water. Ivan did it because he could not resist the physical challenge; David, because he could not stifle his intellectual curiosity. Both of the boys were apprehensive, but David the more so, because he could scarcely swim. He went through it with the do-or-die spirit of the playing fields of Eton, and we felt that the British



▲ GEORGE, making a mouth like a fish, dives down to see a blowfish that Barney has caught

➤ BARNEY photographing the coral-encrusted cannon in the foreground, as one of the children looks over his shoulder



Empire could be proud to count him a citizen.

David took one short look, gasped, ducked his head again for a long look, and then this Tintoretto of the atolls leaped from the water into the boat. He dashed for his pad and began to draw. He had been so overwhelmed by his glimpse of this new world of color that he had no words to describe it and turned to his crayons.

Ivan's reaction was different. He took one look, yelled in excitement, took another, swam to the boat for his spear, and started to chase fish. He chased them wildly up the reef, using no stalking tactics, no refinements of technique, just dashing through the water, the white soles of his feet wiggling and gleaming like two silver mullet. He was a magnificent swimmer and soon seemed to be as much a part of the sea as the fish he was chasing. At last he speared a queen trigger fish and proudly brought it to the boat.

When we boarded the sailboat for lunch, the pitching and wallowing of the boat made me feel squeamish, but we had brought along some dramamine tablets for just such a contingency. Not sure what effects the pills would have, I took just half of one, and then we resumed our undersea voyage down the reef.

The swells were large and soothing. Paddling along on my stomach and peering down into the fairy-tale forest, I began to dream. How gentle the swells were. How heavy my eyelids. "Jane," I heard Barney say, "are you all right?" Of course I was all right. How comfortable the water was. How soothing the rise and fall of the surge. Then, as in a dream, I felt myself being shoved and pulled aboard the boat. How soft the deck felt—and I slept.

Barney had become disturbed when he found me sinking beneath the water looking as though I were about to curl up on a bed of coral for a long sleep. Then he realized I had been drugged by the dramamine. The perfect antidote turned out to be Uncle Herman's forty-horsepower coffee. One large cup

of it, and I was wide awake again!

It was now midafternoon, the wind was rising, and clouds covered the sun. "Where is the Blue Hole?" Barney asked.

"On the inside—about three miles," Captain Joe replied, but he made no move to take us there.

"We'd better go there now or it will be too late," Barney said, and Joe reluctantly turned the tiller, let out the sail, and headed the boat downwind to the flats. We sailed across the two-mile lagoon that separated the reef from the flats and anchored in shallow water. The natives were excitedly talking to one another in dialect we could not understand. Tom was laughing happily, the skipper and Uncle Herman looked serious, the boys seemed scared. "I think you better stay out of dot Blue Hole," the skipper said.

"Let's take a look at it anyway," Barney replied. I knew what was going to happen.

Ivan, the skipper, Barney, and I got into the little dinghy, and sculled out across the flats. The water was barely deep enough to float the boat, and it was hard to see how there could be anything dangerous.

"Dere's dot Blue Hole," said the skipper, and pointed ahead to an area about 50 feet in diameter, which gleamed like a big blue eye from the brown of the flats.

We sculled up to its sloping edge and looked in. A gigantic funnel led downward and disappeared in a blue haze. Big barracudas drifted in the shallows, and deeper a host of snappers floated like white ghosts against the blue. The skipper tossed a piece of seaweed into the center of the hole, and we watched it sink, slowly at first, and then with increasing speed. We stood up in the boat to follow its course. About fifteen feet beneath the surface, it gucked speed and disappeared, sucked seaward into a limestone cave.

"She's going out now," said the skipper. "No man knows where she sucks to. Later she come back and all de water from de sea bubble

up here." He paused anxiously, then went on. "Dere's creatures in dere. You go in dot Blue Hole and de sun won' shine no more on your haid."

"You think it is really dangerous?" Barney asked with a twinkle in his eye.

"I wouldn't go in dere even if you give me pay," Ivan said.

"Well, then, we'd better not take any chances," Barney said, and added, "I'll send my wife in to see if it's safe."

With that the natives roared with laughter. Wives apparently were expendable, and this plan met with their approval.

Now it was I who was on the spot. Since David had lived up to the sporting tradition of the British Empire, could I afford to lose face for the U.S.A.? Barney, with a big spear, stood watch over me as I let myself slowly into the water. On the surface there was no suction.

The agony of it is in those first few seconds, when your feet are in, your body is following, but your eyes are not yet under and you cannot see. You feel your legs are bait for sharks, whales, barracuda, and all of the legendary monsters of the sea. Then your face is under and you see your old friends. At once you are at home again.

"It's all right, Barney," I said as I surfaced. "Come on in."

Barney relaxed his vigil, handed me the spear, and I guarded him while he joined me in the water. We swam out toward the center of the hole and looked down into its depths. Never had we dreamed of such a concentration of fish. Their tails moved in unison, slowly swimming to keep position in the sucking tide.

"Come on in, Ivan," we urged. "If you want fish to spear, here they are." But the legend of the Blue Hole was too strong, and Ivan would not budge.

"I'm going down into it and see what's there," Barney said.

"Don't you dare," I told him. What will keep you from getting sucked on in?"

"I'll carry a rope," he replied.

continued on page 238

NATURAL HISTORY, MAY, 1954



The Fisherman's Porpoise

It came when called
and performed a role that would startle any angler

By F. BRUCE LAMB*

WHENEVER Amazon fishermen gather, someone has a porpoise story to tell. The fresh water, Amazon River porpoise (*Inia geoffrensis*), known locally as *boto*, feeds on fish and generally has a reputation for spoiling the fishing whenever he appears. Besides, he is credited with many natural and supernatural powers.

They will tell you how a lone canoeist is sometimes relieved of his paddle and left adrift by a porpoise coming up from beneath the boat and carrying off the paddle in his mouth. However, this same capricious fellow is reported to have saved the lives of helpless persons whose boats have capsized, by pushing them ashore. None of the dreaded flesh-eating *piranhas* appear when a porpoise is present, for they themselves would be eaten.

In the realm of the supernatural, *botos* are reported to come ashore in disguise during the many *fiestas*

in Amazon river villages. They reportedly enjoy the fun and dance with the girls, and many a fatherless child is credited to the presence of a *boto* ashore during these festivals. A *boto's* eye properly prepared by a *paije* (witch doctor) gives its possessor unbelievable powers, ranging from success with the fair sex to the ability to hex one's enemies.

On many occasions while I was traveling on the Tapajós River, tributary of the Amazon, in the interests of the World War II rubber program, schools of these porpoises played around our small motor launch. Their acrobatic antics in the water were amazing.

On more than one occasion my launch mechanic planned to shoot one with a rifle as they played near by in shallow water. But every time he appeared on deck with the gun, they disappeared as if by signal. Once, by sneaking the rifle into position, he got an effective, glancing shot at one. There was an immediate furor in the water as the whole school gathered to investigate the intended victim for an instant before they all disappeared.

However, my most interesting experience with a porpoise occurred near the village of São Luiz, our temporary operating base for PBY flying boats below the first rapids on the Tapajós. We arrived by launch several days before the

scheduled monthly arrival of the flying boat to prepare for flights to isolated rubber camps in the wilds of Mato Grosso. My Brazilian mechanic struck up a friendship with the local jack-of-all-trades—mechanic, blacksmith, gunsmith—a young fellow named Rymundo Mucuiu (Raymond Chigger). One evening just at nightfall we saw Rymundo leaving the boat landing, where we were tied up, with his canoe filled with fishing gear. About midnight he returned with a good catch and left us some fish for our lunch next day. Later, when he was on board talking shop with my mechanic, I expressed interest in going fishing with him sometime. He agreed to pick me up the next good night for fishing.

A few evenings later as the waning moon was going down in the west, Rymundo and a companion paddled up in a canoe to take me fishing. Effortlessly, we floated down river with the current in the still, tropical dusk. There was a faint reflection of moonlight on the water as the soft evening breeze turned up small ripples. In the background the roar of the rapids

*The author of this article holds a Ph.D. in tropical forestry and has had 12 years of experience in Latin America. He is especially interested in mahogany. As Field Technician for the Rubber Development Corporation during World War II, he explored the headwaters of the Tapajós River and enabled two large rivers to be located on maps for the first time.—Ed.



gradually died away and night sounds of the jungle began to reach us as we moved downstream away from village and rapids. The chirping of tree frogs, the plaintive whistling call of the tree sloth, and an occasional deep-throated grunt of a bull alligator added to the atmosphere of the tropical night.

Rymundo prolonged my anticipation for the fishing by stopping off at Villa Braga, a small trading post, to see his current sweetheart—using the excuse that it was still too light for good fishing. While the young couple carried on their affair, I listened with great interest to an old-timer who was full of tales about the early days on the river, tales of previous rubber booms and of the Cuiabanos who came down the Tapajós from the gold and diamond fields of Mato Grosso to trade gold dust for food and supplies, before routes were opened up to south Brazil.

Finally, social affairs concluded, we found our way back in darkness to the canoe and shoved off once more on our way to the fishing grounds. Rymundo busied himself in the bow with his lamp and harpoons, while the other man guided our progress downstream.

My curiosity was aroused by the paddler, who began tapping on the side of the canoe with his paddle between strokes and whistling a peculiar call. Asking Rymundo about this, he startled me by casually remarking that they were calling their *boto*, their porpoise. This struck me as the purest nonsense, especially after the tales I had heard about porpoises spoiling the fishing. However, Rymundo assured me that he had a certain porpoise trained to come when he called and to help him fish. After two years in the Amazon jungles I had learned to keep an open mind toward the unbelievable, so I sat silently waiting.

As we approached the fishing grounds near the riverbank, Rymundo lit his carbide miner's light, adjusted the reflector, chose his first harpoon, and stood up in the bow, ready for action. Almost immediately on the offshore side of the

canoe about 50 feet from us we heard a porpoise come up to blow and take in fresh air. "Now we're all set," remarked Rymundo, "everybody's here and ready to go."

Directions were given to the paddler, and we moved in among some rocks in quiet shallow water near shore. Rymundo, his harpoon poised above his head, turned his light to illuminate the river bottom. There came a quick thrust followed by the violent vibration of the harpoon handle, which rose out of the water. A grotesque, dark brown fish was soon brought thrashing out of the water into the canoe. Rymundo had some difficulty withdrawing his harpoon from the hard leathery skin of the fish, and I noticed he was very careful not to touch the fish with his hands. "He has dangerous spines," remarked the fisherman, "but he's much better to eat than his looks indicate!"

As we progressed, the fish scattered ahead of us and went for deep water, but there they encountered our friend the porpoise, who was also fishing, and so they came rushing back to the shallows. Several times they sped back so fast they ended up flopping on the beach. At regular intervals of a few minutes, we could hear our fishing companion come up for a breath of fresh air, and occasionally a ray of light would gleam off his shiny body as he rose partly out of the water just off our deepwater side.

At one place, we approached a sunken log in the water, and I saw Rymundo prepare to thrust and then hesitate. "Look," he pointed, "down under that log you can see a large *tucunare* with her young. If you look close, you can see her gathering the little ones into her mouth for protection." I had heard of this fish protecting its young in this novel manner and now witnessed the procedure. Several inch-long fingerlings made their way into what appeared to be a mouth already completely filled. Rymundo, showing a rare conservationist spirit for that primitive region, said it would be a shame to destroy all the little ones for the sake of one

big fish, and lowered his harpoon.

Many strange fish were brought into the canoe as the fishing progressed, and the *boto* stayed right with us as we moved downstream. Finally this section of the fishing grounds had been completely covered, but Rymundo found his catch still insufficient for his steady customers, so he decided to cross the river to another area. Both men took up paddles, and off we went. Failing to hear the porpoise blow for quite a while, I asked about him. The men told me the *boto* lacked patience for such slow travel (it took us about fifteen minutes to cross the river) but he would be waiting when we arrived at the new fishing grounds.

This was no exaggeration, for when we resumed fishing, there he was offshore, giving us his full support and no doubt getting just as good a catch as we were. Returning to São Luiz about midnight, the fishermen assured me that this same porpoise helped them in all their night fishing, scaring the fish from the deep water back to the shallows just as the fishermen scared them out to the porpoise. There seemed little doubt that Rymundo's fishing benefited by the actions of friend *boto*. Although some scientists may not agree that wild animals can be induced to co-operate with man in the manner indicated by this experience, I would urge them to await further checking by other careful observers. The porpoise actually accompanied us at 50 to 100 feet for over an hour. This differed greatly from the random feeding movements I have seen porpoises engage in on other occasions.

I was invited to fish with Rymundo and his friend whenever I wished. However, the next day the plane arrived and we were completely occupied with expediting the movement of supplies into the interior and shipping rubber out to aid the war effort. There was never another opportunity to go fishing with Raymond Chigger, but I have no doubt that he and his porpoise continued by their co-operative effort to provide food for the river village of São Luiz on the Tapajós.

Pictorial

Brain- Busters

By JOHN H. GERARD

One answer out of the three
is correct for each picture



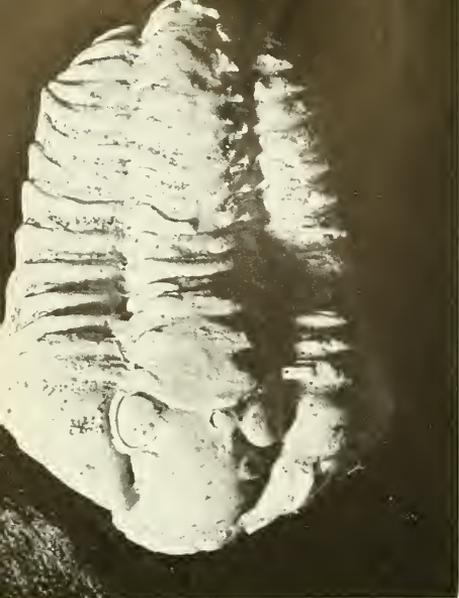
A [▲] This photograph shows:
1. ancient crinoids
2. fossilized vertebrae
3. candies preserved by lava

B [▼] This photograph shows:
1. wasp nest
2. fossil coral
3. rocks formed like the Giant's Causeway

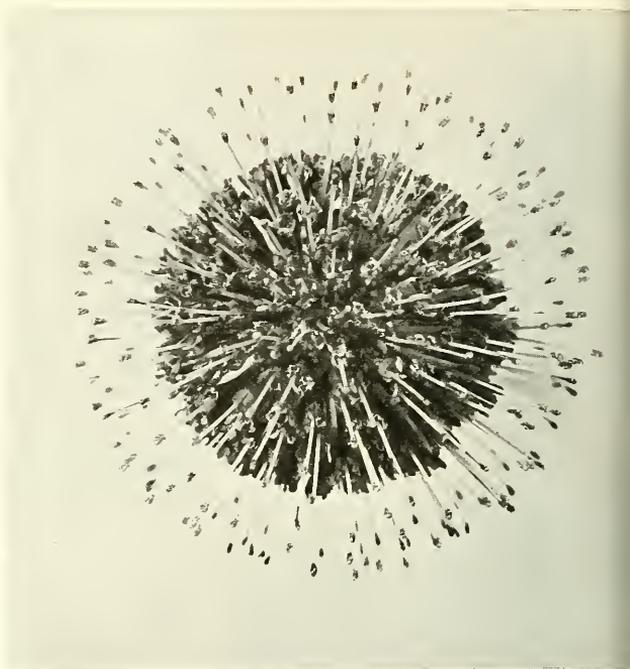


C [▲] This photograph shows:
1. bark of an ancient tree
2. pores in a rhinoceros' skin
3. nest of a social insect



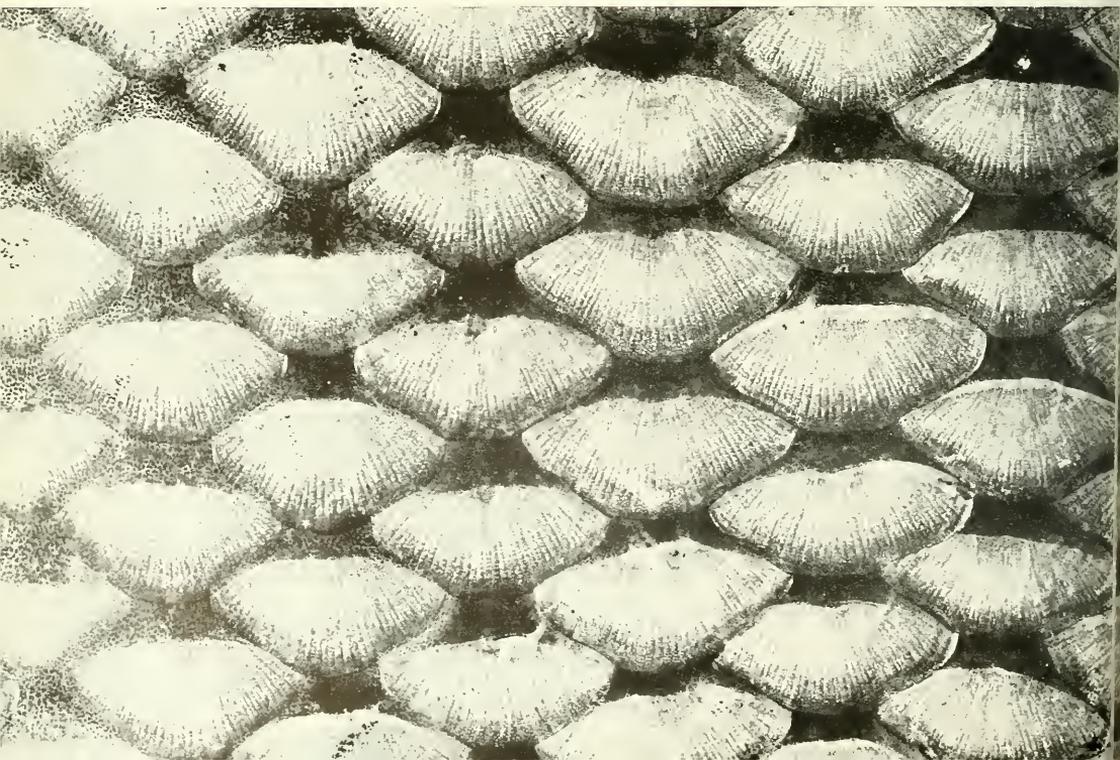


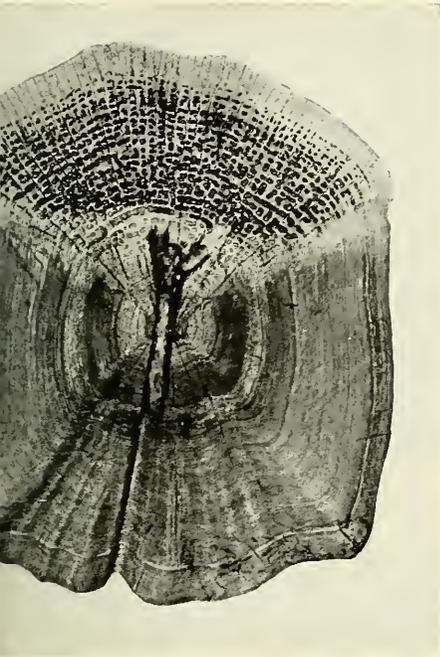
- D** [^] This photograph shows:
1. shed skin of a cicada
 2. immature horseshoe crab
 3. extinct trilobite



- E** [^] This photograph shows:
1. buttonbush flower
 2. model of an atom
 3. enlarged photograph of a marine organ

- F** ^v This photograph shows:
1. arrangement of shells
 2. close-up of some seeds
 3. carp scales



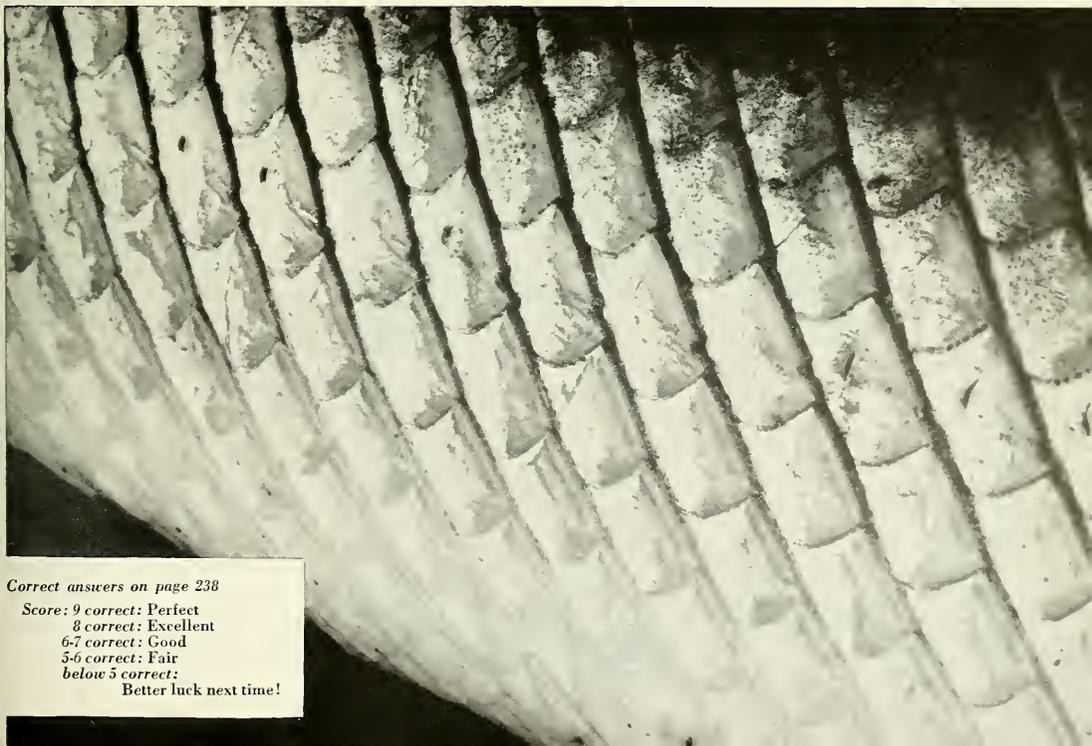


- G** [^] This photograph shows:
1. one fish scale
 2. river mussel
 3. growth rings of a tree



- H** [^] This photograph shows:
1. telescopic view of a planetoid
 2. Osage orange
 3. brain of a hummingbird

- I** ^v This photograph shows:
1. scales of garfish
 2. rasps on a file
 3. scales on an insect's wing



Correct answers on page 238

Score: 9 correct: Perfect
8 correct: Excellent
6-7 correct: Good
5-6 correct: Fair
below 5 correct:

Better luck next time!

▼ "THE NAKED JUNGLE," starring Eleanor Parker and Charles Heston, is an entertaining melodrama

▼ THE INDIANS are strictly Hollywood



▼ THE HERO is almost overcome by the soldier ants, who go through actions yet to be observed by insect scientists



The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

"The Naked Jungle"

"THE NAKED JUNGLE," produced by Paramount, is an entertaining melodrama about a successful, hard-working plantation owner in Brazil, who decides it's time to get himself a wife. His brother and a young widow in New Orleans conduct a mail-order campaign to find someone suitable for him. The young widow (Eleanor Parker) decides that she herself is best qualified, and the brother tells the plantation owner (Charles Heston) a great deal about her, omitting the fact that she had previously been married. The plantation owner wants everything he acquires to be new, including his wife, and many complications arise from this situation when the widow goes to Brazil. They decide the best thing for her to do is to go back to New Orleans, but a great natural catastrophe gets in the way in the form of army ants.

Readers of NATURAL HISTORY will not readily believe that the actions of these ants are factual, but they will undoubtedly be interested in the comments on these creatures by Marilee Wells and Marie Lou Failla of the Museum's Depart-

NATURAL HISTORY, MAY, 1954

ment of Animal Behavior. "As the ants are made to operate in this film, they are a purely fantastic menace, which has no counterpart in nature. They resemble the army ants of tropical America only in an exceedingly remote way.

"Army ant colonies do not combine but function independently. In a species carrying out the most extensive raids, single swarms cover at most 25 yards in width, definitely not 20 miles as in the film. Army ants raid at most 300 yards from the colony nest, not foraging for miles over the countryside. These ants are purely carnivorous, feeding almost entirely on insects, and they normally do not damage vegetation in the least, so that they could not strip the plants as shown in the film.

"The statements with regard to ant psychology are equally imaginary; the idea of control of the mass by thinking individually is in keeping with the technique of fantasy characteristic of the entire film.

"While the army ants of tropical America could kill an incapacitated human in their path by asphyxiation or by the shock of mass bites and stings, they would not strip the flesh."

Mr. John C. Pallister of the Museum's Insect Department makes the interesting observation that "The Indians do not particularly fear an army ant invasion of their huts. They simply move out for a few hours and then back in again to a home that has been thoroughly cleaned of cockroaches, spiders, and other small inhabitants of the thatch and surroundings. Their only worry is that the ants may suddenly bivouac and form their resting cluster in the hut, which would delay the owner's return for another day.

"In contrast to the colossal exaggerations of the ant menace, the menace of the

river waters is all too true and is not usually brought out in stories about plantation life in the Amazon basin. At high water, the Rio Negro may rise 30 or 40 feet, flooding back into the jungle for miles."

And while we are on the subject of geographical location, it should be stated that this film was not photographed in Brazil at all. "The jungle," Mr. Pallister tells us, "looks more like the Florida Everglades than a Rio Negro landscape. Some of the scenes were filmed in Panama and look more like the supposed locale." The insect shots were made on Barro Colorado Island in the Canal Zone.

"The Naked Jungle" has its share of Indians. But Dr. Harry Tschopik, Assistant Curator of Ethnology at the American Museum, states that they "are thoroughly surprising in every respect. Some of them actually are forest Indians, presumably Cuna or Chocó from Panama, where some of the film was shot; but their behavior bears no resemblance to that of any Indians on the face of the globe.

"In one lively sequence, an Indian is executed on the top of a high tower by the simple expedient of shooting him with a single blowgun dart. With a horrible yell he tumbles to earth, dead as a duck, in spite of the fact that the much-ballyhooed curare dart poison is never used against people, for it is not effective against an animal larger than a pig and requires several direct hits to kill a large monkey. Possibly this new dart poison, brewed by Paramout witch doctors, would interest the Indians.

"The costumes are fake, the sets are fake, and even a shrunken head treasured by one of the Indians is a fake. But forgetting the Indians, which I tried to do as soon as possible, the film is thoroughly entertaining."

Brief comments on films previously reviewed

Documentary and Grade A

Annapurna

The ascent of the now-famous mountain

Beautiful and deeply moving film

Conquest of Everest

One of the greatest achievements in the history of exploration magnificently filmed

Stirring epic from on-the-spot material

The Living Desert

Disney's first feature-length True-life Adventure film, showing animal and plant life in the Great American Desert

Marvels disclosed in this film must be seen before one can sense full significance

Song of the Land

Series of excellent movies of various forms of wildlife

Framework on which picture is built will mean different things to different people

Down the Alphabet

Elephant Walk

Life on a Ceylon tea plantation

Elephants and cast put on a good performance

Hell Below Zero

A sock-and-slug drama, laid in the Antarctic

Operations of a whale factory-ship vividly and accurately portrayed

What the Experts Said

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"You get up in the boat and hang on to one end, and I'll dive down with the other."

I did not like this at all, because the current seemed to be flowing more strongly all the time and we could see little pieces of flotsam whirling down into the vortex of the maelstrom. I tied the rope around Barney's waist, climbed back into the boat, and tied the other end to one of the seats.

"All set," Barney said, and, as Joe and Ivan sadly shook their heads, he took a deep breath and submerged.

He sank down into the clear blue water above the lip of the cave. As he swam downward, the cloud of snappers separated and closed again behind him. I caught a last glimpse of a green flipper as he disappeared beneath the rock. He stayed down a long time, and I pulled tentatively on the rope. It was taut and I felt Barney tug it for more line. Then it slackened, the crowd of fish parted, and Barney hurtled up to the surface, his eyes popping through his mask. He leaped into the boat as if Poseidon were prodding him with a trident.

"What was it?" I asked.

"I don't know, but I don't ever want to see it again," he replied.

Barney had swum down slowly, accommodating his eyes to the

darkness and his ears to the pressure. He had felt the gentle pull of the current and allowed it to sweep him into a dark passage. Nothing was visible except rocky walls lined with lobsters, and the shadowy outline of schools of snappers. About ten feet back in the blackness of the tunnel, something still blacker loomed out of the dark. The blackness opened in the form of an enormous mouth, big enough, Barney said, to have accommodated Jonah. The mouth opened and closed not two feet from Barney's eyes, there was a swirl of water as the beast turned, and Barney had the impression of being slapped in the face by a tail the size of a blanket. There was no way of identifying the fish, and no one could be persuaded to go back in and try.

When we returned to Fresh Creek, we were the heroes of the village. The skipper exhibited us proudly to his friends.

"Dey lucky, lucky," he said "Dey's dived in de Blue Hole and dey's came back."

One night the moon, through our shuttered window, played chords of shadow on the bed. We lay and listened to the sighing palm fronds and the gentle lapping of water on the rocks.

"Jane," Barney whispered, "let's see what it looks like under the sea at night."

We slipped on our bathing suits and, taking face plates and an underwater flashlight, stole out into the moonlit night.

On the cliff overlooking the sea we could hear the far-off booming of breakers on the barrier reef. Beneath us the shadowy sea "was moaning and sighing and saying 'hush.'" There was a haunting loneliness to the night. We crept on down the cliff and stood half-hypnotized by the edge of the silvered water. Stars of phosphorescence twinkled as we dipped our face plates in the sea. Barney, carrying the flashlight, stepped into the water first.

"Follow close to me," he said,

but I was already so close to him that he could scarcely move.

Night is alien to man's instincts. He is tuned to the sun and the day. In the sea, even at its clearest, there is mystery and the unknown. It was night and the water was very black!

"Barney, do you think this is wise of us?" I asked.

"We will find out," he said. "Would you rather go first?"

"Oh, no," I conceded. "You go first."

As soon as the dark waters closed around us, I was overwhelmed with that unreasoning fear of something ominous following close behind.

"Barney," I groaned, "I can't stand being behind. Let me go first with the flashlight."

"Don't light it yet," he said, and we traded places. The unlit flashlight in my hand and someone behind me made me feel better. When we had swum out about 20 yards, Barney said, "All right, let's go down and see what it's like." We took a deep breath and sank down into blind blackness. I pressed the flashlight button, and a dull beam of yellow light shone through the water. It formed a halo on a coral cave three feet from our faces. Oh, no, it could not be! Coming out of the blackness of the cave into the center of the beam of light was the head of a green moray eel. Its jaws were opening and shutting, and it was moving sinuously toward me. I catapulted to the top. Barney was right beside me, shouting, "Turn out the light, Jane! The moray's coming after the light!"

The light switch was stuck and I could not get it off. I could feel morays coming up from every direction to attack my naked and defenseless feet. Barney grabbed the flashlight and turned it off. Then we broke every rule of the ocean, turned our backs, and swam ashore as fast as we could. Never since have we dived at night.

This concludes the two-part article drawn from the book that will be published in May: *Treasure Diving Holidays* by Jane and Barney Crile (Viking Press, Inc.).—
Ed.

Answers to

Pictorial Brain-busters

on page 233

- A-1 Fossil stems of extinct animals called crinoids
- B-2 Fossil coral that formed reefs in ancient seas
- C-1 Bark of an ancient tree, a *Lepidodendron* that once grew in abundance
- D-3 Extinct trilobite, a type of animal that was once exceedingly plentiful on earth
- E-1 Buttonbush flower, a common pond-bordering shrub of North America
- F-3 Scales of carp, a common river fish
- G-1 One fish scale. The growth rings show it to be about eight years old
- H-2 Osage orange, the fruit of a hardwood tree used for fence posts
- I-1 Scales of garfish. Like many other fishes, its scales are light on the belly and dark on the back, thus achieving camouflage

closed eyes, in simulation of Death, which identifies them positively with Xipe-totec.

It is of great importance that this material was proved to have been produced at approximately the same time as certain other figures from the Maya region of Tabasco and Campeche. At least half a dozen of the pure Maya figurines were found here at Tierra Blanca, with the typical creamish clay, white slip, and blue paint, brought

as trade pieces from many miles away. These pieces indicate not only simple commercial importation but also reveal a strong technological and ideological relationship between the two areas.

Strong relationships are also shown with Teotihuacán, in the Valley of Mexico. These include articulated figures, small figurines with trapezoidal headdress, identical hierarchic stylization, plus the presence of the Plumed Serpent

and other deities.

Where this smiling type of figurine originated is still an open question. Strangely enough, no molds were found. Why the heads are smiling, and why there were women warriors in a zone where the Spanish conquerors did not find them, remains a mystery. A hundred other questions could be formulated. Every good archaeologist raises as many questions as he settles. In this case there are still many problems to be solved. Time may provide an answer.

LETTERS

continued from page 194

beauty of the area should receive the widest possible circulation.

My father has an excellent background for his remarks, as he made the first irrigation census of the Western States during the last National Census. The work was done for the Department of Agriculture. He also has appraised the area for the Federal Land Bank and is now Technical Director of the Large Irrigation Projects in Haiti, which were recently written up in *Time*.

I thought the remarks of an engineer at this point would be well in order.

WOODY WILLIAMS

Inverness, Calif.

The letter written by Milo B. Williams, Consulting Engineer, follows:

The construction of Echo Park Dam in Eastern Utah would cause inundation and destruction of the only Dinosaur National Monument and fill large portions of the beautiful Park canyons, first with water, later with silt eroded from the mountains.

An additional reason why the Echo Park Dam should not be built and a National Park of great economic and historical value be destroyed at this time is the unneeded agricultural production that additional stored water would provide.

The great surpluses of farm crops which now are and have been produced for many years at the expense of the U.S. taxpayers are evidence that there is no actual economic need for additional costly stored water to bring more acres of land under irrigation at this time, or within the foreseeable future. Not only would the stored water be used for irrigation, but the hydro power generated at the dam would also be available for pumping water to irrigate additional acres to produce unneeded surplus crops.

In the years ahead, if and when growth of the population requires addi-

tional agricultural production, improved farming techniques, constantly being discovered, and the better use of the lands and water supplies now developed can supply the necessary increased production more economically than that created by the destruction of great national assets like Dinosaur Monument and the canyons of Echo Park.

There seems to be a tendency for the Bureau of Reclamation to consider it necessary and desirable that the present generation of engineers rush the construction of all possible irrigation projects, as though future engineers would not be able to do a better and more economical job when there will be actual need for the production created.

As soon as a water storage reservoir is constructed, heavy fixed costs begin and continue more or less throughout the life of the reservoir. These costs include interest and the amortization payments on the investment until the construction costs are recovered, as well as operation and maintenance, which are perpetual costs.

As soon as a reservoir is constructed and put to use, particularly in the middle and lower Colorado basin, rapid filling with eroded materials from the mountains begins. The water storage capacity and economic value of the reservoir decreases in proportion to the rate of filling, until the reservoir is completely filled with earth. Therefore, any reservoir constructed can only be useful and prove to be a profitable investment if built to serve its life during the period when the created production is required by the nation. Why rush the construction of reservoirs, particularly on questionable sites like Echo Park, to store irrigation water and produce crops not needed by the present generation, and thereby rob some future generation of the production when urgently needed?

A Memorandum and Admonition to Those who Favor the Construction of Echo Park Dam.

When you have stood, diminutive,

beside one of our magnificent coastal redwood trees, have you not felt that mankind's anxieties and wrongs could be erased if each could share this awe-compelling sight?

When you have watched the thunderous waves from across the broad Atlantic crashing tumultuously against an uninhabited shore, such as that which is being preserved at Island Beach, New Jersey, have you not felt that such untamed natural power and beauty can lift your spirit above all pettiness?

Shall another such place, which happens not to be well known to many, be destroyed?

The problem at Dinosaur National Monument is not a matter of water requirement, of money, or of any other consideration. All that matters here is the one lasting value—the peoples' spiritual need for the magnificence that only untouched nature can provide.

If Steamboat Rock and other sublime sights of Dinosaur National Monument are lost to view forever because of a dam that is not needed, the disaster for the people of the United States will be far greater than any possible gain to the immediate area.

CAROL H. WOODWARD

Mouthbreeding Fishes

A scientific study of West African mouthbreeders, economically among the foremost inland fishes along the coastal region from Senegal to the Belgian Congo, was the purpose of Dr. Lester R. Aronson's one-year journey to Nigeria, whence he has just returned. Dr. Aronson is Chairman of the Department of Animal Behavior at the American Museum of Natural History.

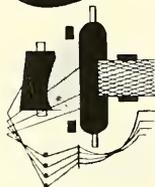
Great quantities of these fishes are eaten there, and since many are small and much of the bone is consumed, they are an important source of calcium in many regions where this mineral might otherwise be deficient in the local diet. Government fisheries officers in Nigeria have recently begun to show an interest

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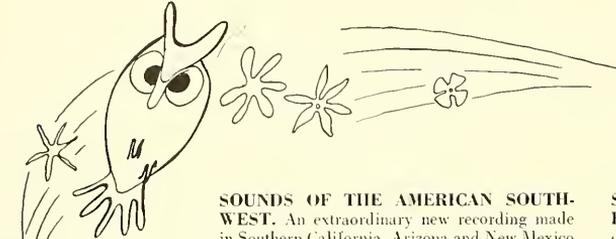
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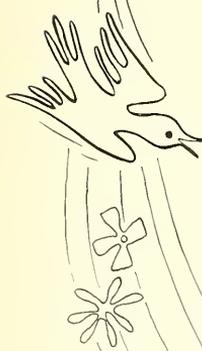


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SOUNDS OF THE AMERICAN SOUTHWEST. An extraordinary new recording made in Southern California, Arizona and New Mexico by Charles M. Bogert of the American Museum of Natural History. Exciting realism in the sounds of Doves, Mockingbirds, Robins, Rattlesnakes, Grosbeaks, Kingbirds, Woodpeckers, Whippoorwills, Hummingbirds, Owls, Crickets, a thunderstorm and flash flood, Toads, Frogs, Bobcats, Beetles, Javalinas, and a Puma. The album includes an equally interesting booklet of commentary by Mr. Bogert. \$7.20 postpaid.

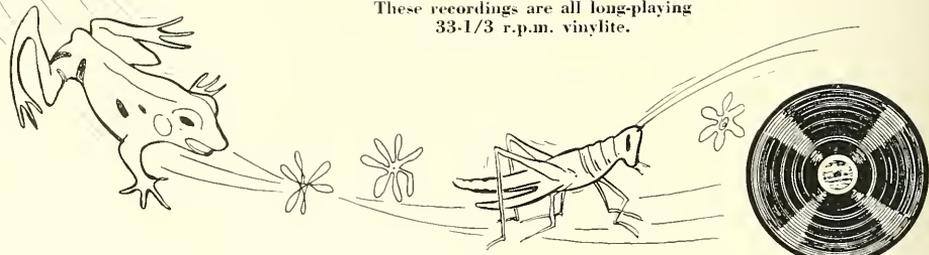


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SOUNDS OF THE TROPICAL RAIN FOREST. Made at the Bronx Zoo and in the dense tropical rain forest of Eastern Peru, this authentic recording is used by the American Museum of Natural History in conjunction with its new exhibit, Men of the Montaña. Parrots, Cicadas, Black Howler Monkeys, Toucans, and Macaws are the predominant noises heard in the Peruvian jungle. Rains are sudden and come rushing across the jungle leaves like far-away drum beats. When the rain subsides, the jungle sounds begin — the cry of the birds, the howl of the monkeys, the call of the toads. Included is a booklet telling how the recording was made. \$7.20 postpaid.

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THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK 24, NEW YORK

LETTERS

Dust-drift

SIRS:

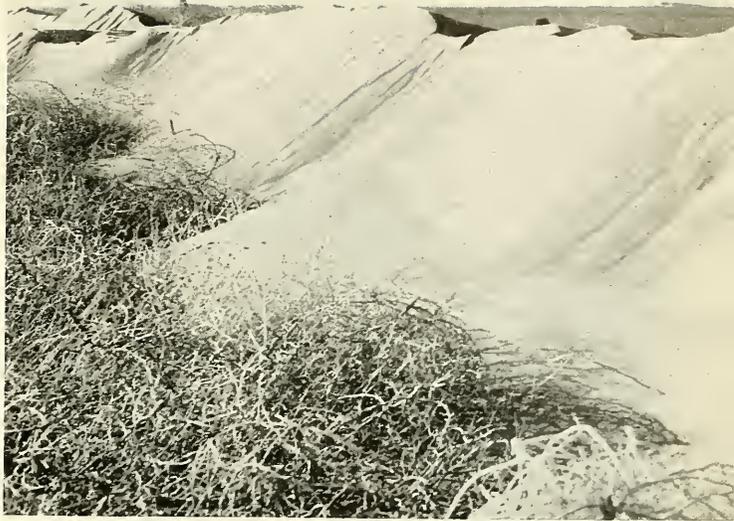
I took the accompanying photograph of a mile-long "sand dune" or dust-drift shortly after it was built up in less than one day by a dust storm in Stanton County, Kansas.

On the 19th of February, a 75-mile-wide strip of this part of the state had the worst dust storm in its history, according to the "old timers." The storm was no blacker than many of those in the "dirty thirties," when one could not see six inches in front of one's face for an hour or more, but this storm lasted for about eighteen hours, and the wind exceeded 75 miles an hour much of the time. The amount of soil moved, if drifts and fields are any indication, was more than all that moved in any one year during the so-called dust bowl years.

This picture shows a small part of a drift a mile long, and it is only one of many that were piled up between 2:30 in the morning and 9:00 in the evening.

Russian thistles and other tumbleweeds not only helped to block the dirt along the fences but piled up, completely blocking the entrances to many houses. The fate of hundreds of beef cattle will remain a mystery until the tumbleweeds have been burned or removed from the dry gulches by future winds. Farmers rounded up their cattle for miles in every direction, and many animals have not been found. The drifts of tumbleweed are suspected of being the burial grounds of stock driven over the high banks of Bear Creek, the Cimarron River, and other dry washes of the country.

Some wheat was blown out by the roots



or sucked out as by a vacuum. Land not in pasture or wheat suffered the most, but no ground could withstand the punishment that was measured out here during that storm. Well-covered ground suffered the least.

H. E. PRENTICE

Johnson, Kans.

Old Squids

SIRS:

I am enclosing samples of things a friend and I found in the bottom of

Poricy Brook, which runs down an old Indian trail in Middletown Township, New Jersey. We are both eleven years of age and in the seventh grade, and we are curious to know what these can be. I would appreciate it if you could tell us.

MISS BEVERLY REED

Red Bank, N. J.

Miss Reed and her friend found things that were probably older than they expected. We admire the eleven-year-old girls for noticing them and Dr. Otto H. Haas of the American Museum's Department of Geology and Paleontology for knowing what they are. He says that three of them are rostra, or guards, of a squid called *Belemnitella americana* (Morton). The fourth is a brachiopod, *Choristothyris plicata* (Lay). All of them are probably 80 million years old.—Ed.

Interbreeding

SIRS:

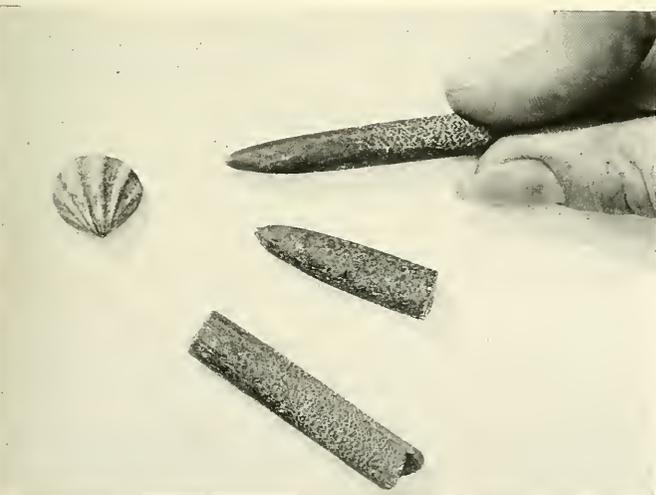
I have a question that may be too complex to answer in a letter. If so, please refer me to literature that discusses the question, namely, why do not birds crossbreed? I have heard this used as an argument against the mixing of different kinds or colors of people.

M. B. STEINMETZ

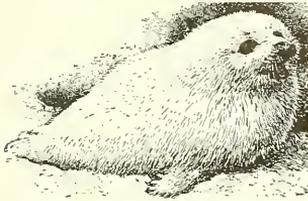
Alden, Kans.

The following comments are offered by Dr. John T. Zimmer of the American Museum's Bird Department:

Actually, wild birds of different species do cross, sometimes extensively, and un-



*The wonders and
terrors of sea adventure*



A Seal's World

By **FRANK STUART**

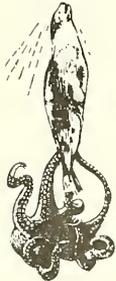
Author of *City of the Bees*
and *Wild Wings*

Illustrated by Walter Ferguson.

This stirring narrative, set against the background of the beautiful and terrifying arctic, traces the growth, incredible wanderings and adventures of a European harp seal called *W'anderer*.

Born in the White Sea off Finland, *W'anderer* is orphaned before she learns to swim. After a desperate struggle for existence, she gains membership in a seal tribe, but on her first migration the pack is separated by killer whales and *W'anderer* finds herself alone.

During the next two years she travels some ten thousand miles, venturing as far south as the New Jersey coast, and encountering a variety of shattering adventures—escapes from polar bears, Eskimo hunters, an octopus, calving ice, and a trawler's net.



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THE RIVERS RAN EAST

by Leonard Clark

Funk & Wagnalls Company, \$5.00
366 pp., 32 photos, 6 maps

THIS hair-raising narrative of a treasure hunter's journey to the upper Amazon region of eastern Peru in 1946 resembles a joint production by Rider Haggard, H. C. Wells, and Sax Rohmer, with incidental music by Edgar Rice Burroughs. Yet, the reader is expected to believe that this lurid verbiage is authentic, reliable, and even valuable scientifically.

The author's purpose was to find treasure believed to exist in the land of the Jivaro headhunters. So in order not to attract attention to this enterprise (or, more likely, to get material for a book) he goes down the Perené River through the "unknown" Gran Pajonal, down the Ucayali ("that little-known river reputed to be the size of the Mississippi") to Iquitos, and thence up the Marañon. Colonel Clark does his level best to convey the impression that this is all wild, unexplored, virgin country; he even has the nerve to speculate as to whether the Tambo joins the Ucayali! But a glance at the American Geographical Society maps, published in 1938, should clarify the situation. Indeed, in 1946, Col. Clark, had he not been so devious, could have driven to the Ucayali River over a highway, stopping at good hotels along the way.

The author, we are told, is the first white man to come back alive from the Gran Pajonal (that "tierra incognita"). While he penned those pretentious words, American Museum scientists were busily assembling a very complete ethnological collection gathered in the Gran Pajonal some ten years earlier.

The reader is also asked to believe that the author learned the Campa Indian language in two weeks (although he consistently misuses and misspells many elementary Spanish words); that vampire bats lack stomachs; that Campa Indians are descendants of Miocene monkeys because both have round heads, and that warriors of this tribe can run 50 miles a day through dense tropical rain forest.

It is too bad, considering the altogether incredible deeds and sights that the author recounts, that he did not photograph any of them; the pictures he

shows us could not be more commonplace. The appendixes are inadequate, incompetent, and of no real scientific value. In brief, and other reviews to the contrary, this is one of the most irresponsible publications to appear in the field of exploration in recent years.

HARRY TSCHOPIK, JR.

TREASURE-DIVING HOLIDAYS

by Jane and Barney Crile

The Viking Press, \$3.95
263 pp., 51 photos

NATURAL HISTORY readers are already acquainted with the "Diving Criles"—the charming Cleveland family of a doctor, his wife, and four children who spend their vacations engaged in the healthful and educational sport of skin diving. To the Criles, the family refrigerator was a thing of beauty when the "sides were studded with abalones which had clamped themselves to the enameled walls" and when kelp-wrapped lobsters and the drooping tentacles of octopus adorned the shelves. Unlike some skin divers who don't know what gustatory fun they are missing, the Criles eat the odd sea creatures they hunt. Jane Crile, the enterprising mother and fine narrator of the family's adventures, imparts some of her unusual and tempting recipes to the reader.

The Criles' diving holidays take place in the kelp beds of California, the coral water of the Caribbean, and the tideless Mediterranean. The treasures they bring to the surface include first century Greek vases, ivory tusks, an eighteenth century cannon, and their impressions of the underwater world. One of the book's most interesting sections concerns their discovery of a sunken ship at Looe Key off southern Florida. Their salvage efforts and detective work lead to the Public Records Office in London and the Captain's detailed report on how the ship sank in 1744.

Until *Treasure-Diving Holidays* came along, the many recent books on skin diving have all been written by professionals in the field, leaving many readers with the impression (no matter how hard the authors try to convince them otherwise) that this is a dangerous and daring sport reserved for experts. Jane and Barney Crile, on the other hand,

who take their precious children along with them on their undersea trips, may start a trend where the "family picnic" will take place in the water and the barracuda instead of the bull will be the fellow to watch out for.

EUGENIE CLARK

THE MATING INSTINCT

- by Lorus J. and Margery J. Milne

Little, Brown & Co., \$4.50

243 pp., 36 line drawings

ONCE again the Milnes have entered their huge storehouse of biological information and this time they have emerged with a remarkable collection of facts concerning reproduction and related items in the animal kingdom. This they have divided into ten chapters concerned with biological differences between male and female, discrimination of the sexes, pursuit, aggressive behavior, courtship, mating, oviposition and birth, parental behavior, sex determination, and ending with an enlightening discussion of the evolutionary value of sex in the survival of species. An appendix to the book contains a valuable list of popular names for the male, female, castrated individual, and young for a large number of common animals. From the manner in which the discussions frequently wander from the asserted objectives of the chapters, one cannot help feeling that the authors were more interested in finding places for their large assemblage of items, than in precise and lucid discussions. For example, Chapter 3 we read of the often observed phenomenon that females frequently flee from the courting males even when they are in heat. This leads to a discussion of the time of mating, and from there to breeding seasons. Then comes a discussion of the relation of light to breeding and the fact that some animals breed in the fall when day length is decreasing. Fall breeding is characteristic of the deer family and obviously suggests a discussion of antlers. Finally the reader encounters the calculation that if an elk or moose were to depend solely on lettuce as a source of calcium, to grow a set of antlers the animals would have to eat at least 150 heads per day!

It is of course a most difficult task when writing a book of this magnitude, to accumulate, organize, and evaluate such a large array of scientific information. Even such talented biological interpreters as the Milnes must have found the undertaking a little fatiguing at times, because one finds a goodly number of gross errors, half truths, and statements based on anecdotal evidence of dubious validity. To cite only one example, we find on page 62 the erroneous statement that in the dark, birds seem to produce a chemical substance that inhibits sexual activity. Actually the

converse is true. The fact is that light stimulates the pituitary gland either directly, or indirectly via the eyes and brain. The activated pituitary gland increases its secretion of hormones, which in turn stimulate testicular or ovarian function with concomitant increases in reproductive activity.

The term "instinct" is the major word in the title of the book, and reappears dozens of times in the text, oftentimes in qualifying combinations, such as "instinctive purpose," "automatic instinct," "close to being an instinct," "instinctive knowledge," etc. Expressions such as these present problems which require considerable contemplation, problems that American psychologists have recently been examining with much enthusiasm. Yet the authors use these terms seemingly without a moment's thought or hesitation and devote not even a single sentence to an explanation of their possible implication or meaning.

Yet despite serious shortcomings, the book can be recommended particularly to those who like to marvel at the infinite wonders of nature, especially since the load is often lightened by amusing observations, odd calculations, references to the classics and appropriate quotations such as, "The man who gets the girls' applause. Must act, not look, like Santa Claus."

LESTER R. ARONSON

OF WHALES AND MEN

----- by R. B. Robertson

Alfred A. Knopf, \$4.50

300 pp., 15 pp. of illus.

THIS is a vivid and stirring book, as many readers know who have already seen parts of it in four issues of *The New Yorker*.

The author, consciously or not, aims to be the Herman Melville of modern, machine-made, steam whaling in the Arctic. His ideas on the old-time Yankee and British whaling are hazy, and his frequent references to it depart widely from fact and lingo in such expressions as "throwing the harpoon." But his description of contemporary whaling is the most informing that has yet appeared.

He sets before us a faithful picture of whaling as "big business" and of its vast logistic, engineering, and navigational complexity. More than that, he shows by narrative and interpretation who and what the present-day whalers are, and what drives or yearnings lead them in crews of seven hundred or more into months of hazardous, toilsome, lonely, and frustrated life in the Roaring Forties and Furious Fifties of south latitude. Their campaigns are removed about as far as possible from every sentiment associated with hearth and home, yet after one voyage, most whalers promptly sign on again.

How one adventurous family skin-dives for fun and for loot!

TREASURE-DIVING HOLIDAYS

by Jane and Barney Crile

You'll share one of the most unusual and rewarding of family hobbies when you read this exciting account of underwater exploration. All the Criles, down to six-year-old George, take their holidays on the ocean floor, where they discover the thrills of a whole new world!

From their earliest adventures with a home-designed diving helmet, the Criles tell of testing new equipment and of the developing skills that widened their underwater horizons. They describe the search for abalones and octopuses off the California Coast, spear-fishing in the Caribbean, and the terrific excitement of finding ivory tusks and gold coins far below the surface of the Spanish Main. Their superb photographs complete a delightfully humorous and informative story of true adventure.

Illustrated \$3.95
(Brief excerpts from the book have appeared in *Natural History*)

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A fascinating panorama of life in the making

The Mating Instinct

By LORUS J. and MARGERY J. MILNE

Two natural scientists well-known to readers of *Natural History Magazine* as writers and lecturers report an sexual behavior in the animal kingdom in all its astonishing and infinite variations.

The Milnes have drawn generously from their inexhaustible subject. Each page is filled with strange facts... the exotic, seductive dances of certain birds... the laborious mate-search of the turtle... the bold precision of the female firefly. Zestful, authoritative but non-technical, *THE MATING INSTINCT* will inform and entertain every nature-lover. With 21 line drawings by Olaus J. Murie.

At all bookstores \$4.50

LITTLE, BROWN & COMPANY
Boston 6, Massachusetts

Fundamentally, Dr. Robertson's book, like *Moby Dick*, is concerned even more with the behavior of man than with the ways of whales. It therefore has much the same appeal as a novel, but it also offers naturalists and conservationists a wealth of information in their related fields.

A factory ship suggests a nightmarish combination of abattoir, packing plant,

machine shop, and petroleum refinery except that, like none of these, it floats. Two thousand tons of fresh water, distilled every day from the ocean brine, are only one of its minor capacities. It is served by a dozen small craft—killers and retrievers—which bounce and roll for months on end, except when a little more "weather" than usual forces them to take half-hearted respite in the lee of a tabular iceberg. Chasers and "mother ship" are equipped with all the latest electronic devices for navigation and communication. Even a lost carcass can escape no longer, because a radio transmitter can be shot into the inflated body of each kill. This, "battery charged, gives out direction-finding signals that enable buoy boat or corvette to sail straight to the dead whale."

R. C. M.

one instance, he followed a nectar gathering bee for a trip that comprised 1446 floral visits.

The book, we are told in the Preface, is intended "to meet the needs of research workers and students as well as practical bee keepers and readers of natural history." The general reader may find the first section (roughly one-fifth of the entire book), which deals with the sensory equipment, the glands, and the structure of the different castes, a little harder going than the three subsequent sections, although it has been the author's endeavor to avoid technicalities throughout.

HERBERT F. SCHWARZ

How did Life come to this planet?

Did Life come to Earth through "spontaneous generation" or by spore-laden cosmic dust? Or has it always existed here? Read A. I. Oprin's now-classic

"Origin of Life"

and find out why many scientists now reject all of these older explanations in favor of Oprin's theory that living tissue was preceded by a gradual evolution of organic substance—of the carbon and nitrogen compounds on which all organisms depend.

New York Times writes: "Easily the most scholarly authority on the question of the origin of life as treated by the scientists... The book is excellent. It will be a landmark of discussion for a long time."

Amer. Chem. Soc. Journal says: "A very fascinating hypothesis. Many chemists will want to read this volume over and over again."

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THE BEHAVIOUR AND SOCIAL LIFE OF HONEYBEES

----- by C. R. Ribbands

Hale Publishing Company, Hapeville, Georgia, \$4.50, 352 pp., with 9 plates of photos and 66 other illustrations

THE author of this erudite as well as interesting volume is the Principal Scientific Officer, Bee Department, in the Rothamsted Experimental Station at Harpenden, Herts, England. In its pages he has assembled in brief and properly classified the results of the observations and experiments by which research workers of many nationalities are little by little piecing together an informed picture of the life of these insects and its motivations. Not always are the conclusions of the experts in complete accord, and it is one of the helpful features of this book that, in addition to summarizing the conclusions of others, it furnishes analytic guidance, even to the extent in the less explored parts of the subject of supplying "inference and speculation (a necessary prelude to future research)."

Although man has for centuries been interested in the honeybee, and many outstanding individuals of the past spring to mind as diligent students of its ways, there has been a particular concentration of energy during the last 25 or 35 years in exploring little known phases of its life. The number of references in this well-documented volume to publications of comparatively recent or even current date furnishes a gauge of the need for a book of this type in which so much information culled from competent sources that was unavailable in earlier standard works is made accessible. In a tumultuous and worrisome age one is impressed with the undistracted persistence with which many of these contemporary research workers have pursued their tasks. The author himself is an example of this complete devotion. In

THE CHALLENGE OF MAN'S FUTURE

----- by Harrison Brown

The Viking Press, \$3.75

290 pp., 31 figs.

IT IS hard for most of us to realize that the things to which we are accustomed, the life that we know, and even the kind of human beings we are have no permanence. Although we know that the past was different, we are inclined to believe that the present will continue—perhaps with some improvements. This is a dangerous attitude, not only for our immediate values but for the ultimate destiny of mankind. It is therefore a necessary duty of science and of statesmanship to consider the trends in society that may affect our future.

Fundamental among these is the relationship of population to food and of civilization to its resources. In the past few years an increasing number of books have dealt with aspects of these relationships. Some have been extremely pessimistic; others have minimized the dangers, placing a reliance on the miracle-producing powers of science.

Here is another book on the same theme. But this one is written from the vantage point of a very broad and detailed survey of the resources of food, energy, and things that are available for population increase and for the maintenance of industry and society. Harrison Brown, the author, is a biochemist and brings to this task a professional background that gives his critical appraisal considerable authority. His conclusions, although not altogether reassuring, are not without some hope if we can learn the lessons implicit and explicit to be read in his appraisal of these resources. He sums it up by suggesting three future possibilities: 1, the most likely is a reversion to agrarian existence; 2, a completely controlled, collectivized industrial society is possible if war can be avoided and science can find the substitutes for our disappearing resources; and 3, a

world-wide free industrial society. This last he regards as the most difficult to achieve and to maintain. But man has it in his power to do so, provided he exercises the intelligence, wisdom, imagination, and courage that it requires.

Harrison Brown brings a clarity to a subject that had become blurred by emotion and controversy, and in doing so, has performed a valuable service.

HARRY L. SHAPIRO

ENGINEERS' DREAMS

by Willy Ley

Viking Press, \$3.50

239 pp., 46 illus.

ENGINEERS dream up queer things, some of which strike the layman as so preposterous as to be outside the realm of possibility. Willy Ley writes most clearly and interestingly of some of these dreams, which could have changed the course of history or might effect whole continents in the future. Some are so daring in their initial stages as to press on the lunatic fringe. But when the basic data is assembled, demonstrations worked out, and careful analogies applied, the idea that taxed credulity at first inspection really falls within the capacity of man's accomplishment. Whether the end justifies the effort requires careful appraisal by the reader.

The list of the "great projects that could come true" begins with the tunnel under the English Channel and then includes less well-known devices, which would give man greater mastery over geographical or physical barriers. Nine are described, and they all intrigue the imagination. It is very interesting to note how different minds have attacked the same problem, as for example the establishment of floating airports to break long transoceanic flights. Several of these schemes employ the floats and structures of conventional, current practice, albeit in a grand manner, but the average reader will be surprised that one seemingly practical and feasible structure would be entirely of ice.

Heat and power from subterranean sources or from the sun have called for ingenuity along several rather obvious engineering lines, the refinements to secure maximum efficiency providing the departures from the obvious. Dams to divert rivers and alter the climate of high half a continent or to cut off the sea, reclaim shores exposed by evaporation, and develop power are devices that often enter engineers' dreams. The most frequently recurring theme, however, is that of power, either as the primary goal or as a by-product. The reader of this challenging book may well conclude that with so many fertile schemes for

power in the dream stage today, the future may well find mankind with power to spare.

HAROLD E. ANTHONY

A FIELD GUIDE TO THE BIRDS OF BRITAIN AND EUROPE

by Roger Tory Peterson,

Guy Mountfort and P. A. D. Hollom

Houghton Mifflin, \$5.00

318 pp., 16 line drawings, 64 plates

MANY insistent inquiries have been received at the Bird Department of the American Museum during the past quarter century for a handbook on the birds of Europe. Our replies have had to state that the small works are out of date, whereas the recent and comprehensive works are bulky. Nobody wants to lug about, for example, a five-volume library. Roger Peterson has now "crossed the pond" and, with two well-qualified colleagues, has answered the tourists' prayer. More than that, the book, which really fits a pocket, is being issued simultaneously in several European languages. It will therefore fill a wide need, and the authors deserve to grow rich!

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continued on page 286

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The Vanishing

▲ THIS WALL of Alii fishpond is four to five feet high and from three to four feet wide. The sea at right is at low tide. When the tide is in, the waves slosh over the top of the wall

▼ ALONG THIS SLUCEWAY in the foreground, the Hawaiians once stood and speared fish that were escaping with the ebbing tide. As usual on Molokai, the wind was blowing when this photograph was taken. The waves of the pond push against the stone wall, whereas just behind the wall the wind is cut off and the sea is smooth



Once they gave food for thousands of islanders. Now they are doomed to disuse by silt washed down from the overgrazed hillsides

Fishponds of Molokai

By NORMAN K. CARLSON*

Photographs by the author unless otherwise credited

ONE of the early crops cultivated in the Hawaiian Islands was fish. Before the pineapple was known, when sugar cane grew wild and haphazardly, before beef and mutton were available, fish were cultivated in an elaborate system of ponds that bordered the islands.

Now other crops that grow on the land occupy the Hawaiian workers' attention and the fish farms are neglected, decaying along the shore as the diet of the people has changed.

However, there are still salt-water fishponds on the island of Molokai, in the Territory of Hawaii. At one time there were over 53 of these fishponds scattered along the south coast of this little island; they enclosed 2000 or more acres of the sea within their rock walls. Ten or so of the ponds are used today. The rest have been abandoned to the sea and the mud.

Forgotten is the story of the people who built these ponds. Forgotten is the story of the big pond at Palaau. Molokai is no longer thought of as the "fishpond island." For almost a century it was known



▲ IT TAKES MANY to man the nets that catch the fish in the shallow waters along the lee shore of Molokai. It is with nets like this that some of the fishpond owners harvest the mullet (*amaama*)

as the "forgotten island"; today it is called the "friendly island." Yet the alert traveler sees remains of the ponds all along the south coast, and when he asks about them the answer is vague.

Yet for those who relish good fish, the value of these ponds is still great.

One warm, sunny day, as I walked along the main street of Kaunakakai, I wondered if I were not in the wrong town. It looked as if Macy's had started a branch shop, 5250 miles from the main store. Homemakers were rushing to the little Molokai Market as they

would to a New York price-cutting sale. Being curious, I moved up the wooden steps of the Market, elbowed in, and saw behind the counter boxes and boxes of fat, luscious-looking fish. On sale were 400 to 500 *amaama* (mullet). Each fish weighed three to four pounds, and within a few hours all had been sold.

That evening at the Midnite Inn, half a block away, I ate *amaama*. So help me, the fish rivaled the rainbow trout in tastiness.

After dinner, I went back to the kitchen to chat with Art Kikukawa, co-owner and manager of the Inn.

*NORMAN K. CARLSON collected the information for this article during his residence on the island of Molokai, where

he was a Range Conservationist with the Molokai Soil Conservation District. Later while he was stationed with the army in

Honolulu, he gleaned further facts about the fishponds from archives, museums, and interested persons.—ED.

He told me where the fish had come from and how to see the salt-water fishpond in which they had been caught.

Next morning, I drove eastward along the coast. As I passed over the rough road, I noticed rock walls, half circles, and broken half circles extending out from the shore into the sea. Farther out, dimly seen, was the fuzzy white line of the surf. The waves were breaking on the

coral reef almost a half mile from the shore.

In about a leisurely hour, at about 15 miles an hour, I came to the lane that led to the front yard of the home of Mr. and Mrs. Harold Heustace. From the front lawn, the Heustaces pointed out their pond, called Kaopeahina fishpond. It lay there calm, peaceful, and a bit strange.

The east part of the rock wall

began about 50 feet from the front of the house. It ran seaward 100 yards, bounded to the right, and then slowly circled back to the shore, a long quarter of a mile away. Impetuously I rushed over and walked along the parapet. It was high tide, and the waves from the sea, though not large, splashed over the stones and got me wet.

Inside the fishpond wall, the trade wind stirred up little waves that rolled gently shoreward. Within this man-made rock wall were 19½ acres of the sea. It was from this pond that the *amaama* had come.

▼ FIVE FISHPONDS show in this photograph, two of which are intact and three no longer in use. The broad bands seen in the water are the foundations of ponds that have had their stones removed for walls or buildings. The narrow bands close to the shore enclose intact ponds. The roundish one in the center is Kaopeahina Pond. The oblong one is unnamed

U. S. Geological Survey photo, Department of the Interior.





◀ THE SILT that is filling the fishponds is coming from places like this—good rich soil, here about 25 feet deep. Before the heavy rainfall of 1950, a road flanked this gully on Molokai. The gully worked back into the pineapple field beyond the author, and a road had to be made elsewhere

▼ KAOPEAHINA FISHPOND lies quiet and smooth in front of the Heustaces' home. The tide was low and the mud that is filling the fishponds is seen in the foreground near the lawn

The Heustaces were gracious hosts and answered my many questions. They told me about the fishponds, but even *kaamaianas* (old-timers) as they were, they couldn't tell me when their pond was built or who had built it. They told stories about the building of other ponds, all of which were tied in with a complicated, intriguing, and often violent folklore.

Kaopeahina fishpond was built by the early Hawaiians so long ago that the people of today credit the *menehunes* (gnomes) with its construction. The *menehunes* were quite the engineers, for folklore claims it took them just one night to build it! Kaopeahina's walls are five to nine feet high, three to five feet wide, and more than a half mile long. The loosely fitted rocks weigh up to several hundred pounds apiece, and there are thousands in this wall.*

The Heustaces told me that fish farming takes a lot of work and time. In April, 1946, a tidal wave rolled in and severely damaged the rock wall, and many of the choice



fish escaped to the open sea. It took many weeks to gather up the stones and replace them. Four years later, a heavy unseasonal storm in August broke down part of the dike, and there were more weeks of hard work.

The sea is not the only problem. During heavy rain, tons of soil from the overgrazed hills are dropped into the still waters of the pond. Consequently, it is no longer as big as it once was.

Yet... "This is a very fat pond; the fish get fat here," Mr. Heustace told me. "The pond next to us and to our east is a skinny pond. There the fish get big heads and do

not grow big bodies. We need a little *kokua* (help) to better our pond."

Two *makahas* (gates) are needed for the pond. A good, well-constructed gate at the east end would, when open, let the water and the fish come in rapidly on the rising tide. A *makaha* at the west end of the deepest part of the pond would sweep the mud seaward with the fast-flowing ebb tide. This lower gate would be made so that the fish could not leave with the outward-moving water.

Mrs. Heustace added her practical bit. She wants a reservoir made in the stone wall. It would be in

*We are informed that stone-built fishponds, similar to those of Hawaii, occur in many areas of the Pacific. Their historical association with any specific ethnic or racial group is an open problem, since they occur among Malayo-Polynesian peoples as well as in Australia, and since they are not built any more, though occasionally repaired. Those who believe that the legends of the Menehune and what might be called their Melanesian counterparts contain some historical truth, feel that these legendary people might possibly represent the earlier inhabitants of the islands employed in the construction of certain works by a people that arrived later. Others believe, however, that there is no historical veracity in the legends.—Ed.



▲ AT HIGH TIDE, the water inside the curving pond wall almost meets that of the sea. When it is very high or when there is a storm, the waves break against the rock walls and often damage them

◀ THE GATES (*makahas*) have gone modern here. The slots are so fine that the fish inside the pond cannot escape through the gate when the water flows out with the tide. A good *makaha* would be made so that the fish could enter but not leave the pond

the form of a fish trap, which the fish could enter but not leave. Here she could have a supply of fish for sale at anytime, easily caught by a dip net. Now when fish are wanted for market, the whole pond must be seined. The large catch must be sold at once, and it might exceed the demand.

Mud, heavy seas, and the lack of gates are serious problems. But at the time, there was a 30-pound problem in the pond. Some way or other, probably during a very high sea, a large, lazy, hungry barracuda had flopped over the sea wall and each day was eating too large a share of the little *amaama*. This fish so far had eluded nets, hooks, and traps. He roamed the pond as if it were his own. Someday Mr.

Heustace will catch this profitless guest, and the barracuda will be the main course of a tasty, rewarding dinner.

The Heustaces told me that their pond could produce eight to twelve tons of fish a year. A half ton of high protein food per acre is a good yield anywhere.

Along the lee (south) shore out to the wave-breaking reef line of this little island, the water is relatively shallow. At high tide the water is three to twelve feet deep. Here and there at low tide the floor of the sea can be seen, for the water is only a few inches to several feet deep.

There is good fishing in this shallow sea and in the outer cavernous coral reef. At low tide, people wear-

ing shoes walk through the shallow waters netting and spearing the small fish, squid, and crab. Along the outer edge of the reef, fisherfolk dive from small boats into the deeper waters and spear the many kinds of fish and lobsters that hole up in the coral reef. Close in, children are often seen with their little nets and spears intent on fishing. Some may be out just having a good time on a hot sunny afternoon.

Inside the good ponds the fishing is excellent. Here, in stormy weather or on lazy nights, fish can be easily and quickly caught.

Undoubtedly it took a great many people to build a fishpond. Captain Cook in 1778 estimated that there were over 300,000 Ha-

▼ ONE HUNDRED YEARS ago, the water was four feet deep here, and this was the most famous fishpond in the islands. Now that soil eroded from the overgrazed

uplands has taken over, the scene is an ugly plain of red salt-encrusted soil. Some grass will grow on little hummocks, and a few trees start but do not last



waiians scattered through the islands. Molokai very likely had a population of 30,000 or more, which should have been enough people to build and care for its many ponds.

The Hawaiians of today who put folklore aside imagine the fishponds were built in the following manner. The chief would give orders for all the people to gather at the place chosen by the local fishpond expert. Rocks would be brought from the hills by a long human chain. At the shore the engineers would place the rocks, and gradually a curving wall would form.

An ideal fishpond should be two to three feet deep at low tide. It must have a relatively flat, firm bottom in which to grow the abundance of fish foods needed for a top-producing pond.

After they were built, the fishponds still took a lot of labor. The walls had to be kept in repair, and frequently the people had to clean out the mud and tramp the bottom of the pond firm.

A few miles east of Kaopeahina pond is Kalukia fishpond (also called Kupeke and Buchanan's). Thirty-three acres of water are enclosed within the rock walls; and next to Kaopeahina fishpond this is the most productive on Molokai.

Kazukichi Yoshimura, a friendly little Japanese, and his wife lease this pond and have lived here many years. While we drank pop and beer, they told me the story of their pond. Their problems were similar to those of the Heustaces.

Mr. Yoshimura and his wife work hard to keep their pond stocked with *amaama*. In a jeep they travel to the shallow coastal waters where the *amaama* spawn and where there are many schools of the little fish. They scoop up the fingerling *amaama* in a net and drop them into a wire-mesh trap that is submerged. After the fish farmers trap 5000 to 7000 small fish, they sink a washtub into the sea. The wire net, filled with the little *amaama* is transferred into the tub. Then the producer hurriedly drives home and dumps the fingerlings into the pond.

In this laborious way, they have planted millions of little mullet.

Yet one barracuda can gobble up many days' work.

One day as I drove along the highway from the airport, I saw long red whirlwinds down by the shore. My friends told me they were caused by winds flicking up the red dirt of the dusty plain. This was Palaau, where once there was a fishpond famed throughout the Hawaiian Islands. My friends could tell me no more.

So I drove down to Palaau. About four miles west of Kaunakakai, as the Hawaiian crow flies, lies the great red area.

Through an opening in the trees I saw the western half of Palaau fishpond. The tide was low, the pond almost dry, and each gust of wind raised long clouds of dust. Yet when the tide is high, a few inches of water cover most of the barren plain.

Looking seaward, where once stood a great stone wall and where the large canoes paddled in, there is now a ragged strip of mangrove. Inside the mangrove is sand, mud, and salt-encrusted soil. It is a hardy plant that can survive in this environment. *Akulikuli*, a coarse, salt-tolerant plant, thrives in the eastern half of the pond. At the edge of the pond and breaking inward, the *kiawe* (mesquite, to a Texan) grows. Some trees were thriving and some reluctantly dying.

No one lives on the north or west side of Palaau today. Only the cowboys, the beeman, the soil conservationist, and a few fisherfolk pass by. But 200 years ago, 1000 people may have lived by this pond. Here could have been the center of Molokai's government.

From the air, a channel can be seen through the shallow waters from the outer edge of the coral reef to the mangrove strip. It was through this channel that the outrigger canoes passed.

Fish, sweet potatoes, and taro—there was enough to feed 1000 people or more. Today no one lives where once the village of Palaau stood. Why?

From the historians and soil conservationists, from the Hawaiians themselves, comes the many-side story of the abandonment of Palaau. A great war in the late 1700's killed almost half the people of Molokai. Palaau was very near the battlefields, and undoubtedly it was hard hit. Diseases came in with the white man, and another half of the remaining people died.

It took a lot of people to keep the 500-acre fishpond in top production and repair, and with the decline in population, the pond slowly broke down and filled with mud.

The taste for beef led to the death of the village around the year 1857. Mr. George P. Cooke told me the story of the end of Palaau.

Some time around 1857, all the men of the village were caught rustling longhorn cattle. A quick trial was held, the men were convicted, and sentenced to a jail term in Honolulu. The wives and the children followed the men to Honolulu, where they all pitched in to build a jail to house their convicted kin.

Where once was a great fish pond, there is now a lifeless area. Four to eight feet of the good upland soil of Molokai has been laid down in the pond. It no longer produces fish, nor any other crop of value.

The day was not spent. I drove on, over the almost-forgotten though once-prominent road of Molokai. Through the *kiawe*, from bounce to bounce, I saw abandoned rock walls stretching out into the red, muddy, shallow sea. When I got back to Kaunakakai, I asked about these little ponds. No one knew anything about them, not even their name.

No longer are fishponds built on Molokai. They are only repaired, maintained, or abandoned to the sea and to the mud carried down from the abused and overgrazed hills. They stand as a tribute to a people that once lived on Molokai—a people who were clever and worked with nature in such a way that they lived well.

Ladybird

CONVENTION

Their value to orchards has long been known, but strangely contradictory circumstances seem to cause them to swarm in great numbers

By

WOODY WILLIAMS

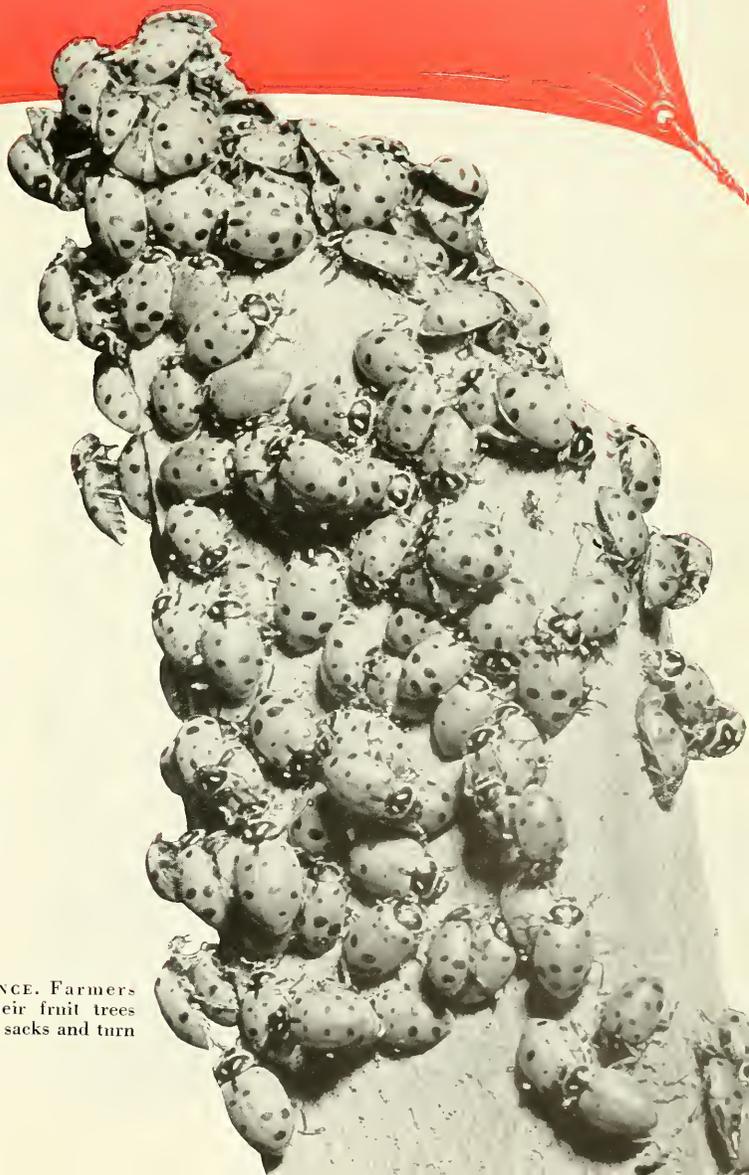
All photographs by the author

ONE of the most intriguing spectacles in nature is the annual swarming of certain species of insects. Butterflies in particular are famous for their habit of swarming in the same area each year. But less well known are the activities of the ladybirds of the family Coccinellidae, although we were introduced to the group at an early age with Mother Goose's concern for the ladybird whose house caught on fire.

Unless we became farmers or gardeners, we probably forgot all about ladybirds, but I can remember my uncle going to the high Sierras each year to bring down a sack of ladybirds to release in his prune orchards to combat aphids.

Unfortunately the beetles were transferred from the cool mountains to the hot valley, and it has been found that such a radical change in temperature causes the insects to disperse rapidly and to be of little benefit in destroying aphids.

➤ **LADYBIRDS IN ABUNDANCE.** Farmers troubled by aphids on their fruit trees gather the beetles in gunny sacks and turn them loose on the trees





▲ THE HEART of a ladybird cache in Inverness, near San Francisco. The thousands of ladybirds turned the trunk of this California date tree bright red with their mass. Such swarms of ladybirds occur along the coast in the cool fall months. In the Sierra Nevada Mountains, they actually hibernate, in the snow. But ladybirds also swarm in very hot weather

Years later I was again introduced to ladybirds up a deep wooded canyon at Inverness in Marin County near San Francisco.

I found that I was trampling on ladybirds. The bright orange-red beetles swarmed over the ground and up into a large bay tree. Its trunk was livid with the squirming mass. This must have been the type of swarm from which my Uncle filled his gunny sacks in the Sierras, only here I was down almost at sea level.

It was not until I talked to the late Dr. Edwin C. Van Dyke, world authority on beetles and for many years Curator of Entomology at the California Academy of Sciences, that I realized what an interesting phenomenon I had encountered at Inverness. For it seems that these so-called caches of *Hippodamia convergens* and related species are not hit or miss affairs. The insects pour back into the same spots year after year. Their behavior does not seem to be related to breeding. Rather it may serve to keep them warm, for in the Sierras, the swarms hibernate and in the coast ranges

the caches occur in the cool spring and fall months.

Swarming areas for ladybirds have been reported from such widely scattered spots as western United States and Turkestan in Central Asia. There, the swarming through the years is said to have sometimes produced a substratum of between one to two inches deep made up from the bodies of countless beetles.

Extreme heat, however, also seems to bring the clans together. In Arizona, for example, the ladybirds have been seen to swarm and then go into a stupor during hot weather. Another ladybird, *Rodolia guerini*, swarms on the underside of leaves in India during the hot, sticky weather.

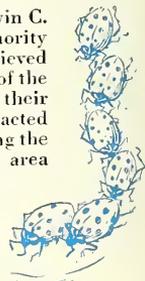
Scattered studies on ladybirds suggest that the urge to hold a convention may commence with too cold or too hot weather, a full stomach or hunger.

In the interior valleys of California the insects may be caught in updrafts and carried into the mountains, where perhaps they are swept together in canyons. Dr. Van Dyke stressed another factor that may come into play to determine the final swarming area, that of smell. He pointed out that the beetles have a strong odor, which when they are swarming is quite noticeable for some distance. He believes that this odor remains in the congregating area to attract the insects back the following year.

But the great bulk of information on ladybirds is conjecture. Biologists still have to explain why ladybirds "fly away home."



◀ THE LATE Dr. Edwin C. Van Dyke, an authority on beetles, who believed that the strong odor of the ladybirds permeated their swarming areas and acted as a guide for bringing the beetles to the same area each year





▲ “WE IMAGINED we had stepped into another world...”

In a Dutch

Cormorant Rookery

Adventures in an unbelievable wilderness in densely populated Holland

By KLAAS HULSBOS

All photographs copyrighted by Klaas Hulbos

EVERY day the cormorants cross over a vast stretch of marshes, pasturage, and pools in the north-east corner of the Netherlands. Alone or in groups of a few together, they come across from their rookery on their way to the shallows, rivers, and lakes, to gather

their daily fare. But for the return flight they often assemble in large troops, which in V-formation or in a long line, are outlined against the sky like strings of black beads. At times, when the leader is relieved, the whole formation becomes a whirling mass, but as soon as a new

leader has gone to the front, they once again head in marshalled phalanxes for their nesting place.

When their destination comes into sight, the troop breaks up and each bird glides on its own course, descending in wide circles. At last they perch on or near their nests,



▲ IN EVERY FORK and on every branch where they could get a hold, the birds have built their large nests of sticks



▲ THE CORMORANT is protected only "provisionally," because it eats fish

forth show us the direction of their rookery, and the trees can be seen from afar over this flat country. A narrow ditch gives entrance to this strictly guarded territory.

When the boat is moored and we follow the narrow footpaths, we find ourselves in a real paradise for birds. The thickly growing trees, entwined with ivy and hop like a pocket jungle, form an excellent and quiet nesting home for all kinds of songbirds. Ducks are swimming in the ditches and the pond, and somewhere or other, close to the paths or in an old pollard-willow, a brown-marked female sits on her eggs. We hear kestrels call-

▼ "THE YOUNG looked at us philosophically..."



where they are acclaimed by partners and neighbors with loud and low *koarr* notes.

The cormorant is not a rare bird in North America, but the extraordinary thing is that this same species nests differently where it occurs there in Greenland and Canada—on cliffs instead of in trees.

In the Netherlands, nearly all birds are protected by law. They may not be shot, their eggs may not be collected, nor their nests disturbed. Only two birds are completely unprotected—the English Sparrow and the Carrion Crow. Besides these, there are fifteen species that are protected "provisionally," among them the cormorant, owing to its harmfulness to the fish supply.

A long, very attractive trip by a flat-bottomed boat through the marshy surroundings takes us to this rookery near Wanneperveen, one of the largest and finest. The property belongs to the Society for Nature Preservation and Bird Protection. The birds flying back and

ing from all sides. They often have their eggs in the baskets that have been placed in the trees especially for the ducks, to give them safe nesting places. Gray Herons, with a hoarse croak, fly away from their nests, where they already have their clamorous young. But all these cries, songs, and sounds are drowned by the *koarr-koarr* of the hundreds of cormorants and their noisy young.

In the center of the forest they have their settlement. When we get a glance at this colony through the greenery of the surrounding trees, we imagine that we have stepped into another world. The eyes are

confronted by a scene we might expect to find in the wild parts of the world rather than in the heart of the overpopulated and heavily cultivated Netherlands. We see in front of us a forest of tree-skeletons, whitewashed by the excrement of the cormorants, bleached and burned by the action of the lime, overloaded with similarly whitewashed nests, on which the dark birds contrast strongly. In every fork and on every place where they can get a hold, the birds have built their large nests of sticks. Every dead branch and twig suitable for building is broken off, and so the dying trees stand there until only the

bare skeletons remain and until such time as a storm shall strike them to earth.

Great activity prevails throughout the colony. On some nests, the dark birds sit on their eggs; on others, we see the half-grown young above the edges of the nests. Birds fly off and on, and their cries sound from all quarters. In other trees, we see them engaged in breaking off twigs with their bills and carrying them to the nest they are constructing. But twigs and branches are valuable in a cormorant rookery, and the partners must remain alert. Otherwise, the laboriously collected foundation will be demolished by neighbors, and the owner, returning with new materials, will find nothing left. Then for a while the bird will sit looking foolishly around; but it has a great urge to build, and so either on the original site or elsewhere it will at last finish the job.

But of course we are not content with only a superficial view. He who has a delicate stomach, does better to keep away, for the stench of rotting fish and excrement are not exactly pleasant. Be sure not to forget your waders, because you will sink up to your ankles in the soggy soil, which is covered with a deep layer of droppings accumulated over the years. An old suit or pair of overalls may not be amiss, as unpleasant things descend upon you from above. Excrement is showered down as if from a garden hose, and half-digested fish, disgorged both by the old birds before leaving the nests and the terrified young, fall all around. From these we can see how wonderfully rapid their process of digestion is and how unbelievable their gluttony.

We can begin to understand why fishermen detest these birds so much. In varying states of disintegration, eels and all kinds of fishes descend, and among them are speci-



◀ IN THE SPRINGTIME, they show long thin white feathers on head and neck



▲ LACKING "WATERPROOFING" on their feathers, they would sometimes perch on a stone or branch and spread their wings to dry

mens which, served up better, would adorn any table. Wherever we go, the old birds deposit their breakfast at our feet and dash from their nests. Most of the nests are beyond our reach; but in those that are accessible, we see three to six dirty bluish-green eggs or young in various stages of development. There are newly hatched chicks, just skin and bones, and well-grown young, as fat as porpoises, which look at us philosophically.

During the war, these fat youngsters were caught and made into "gamepie," specially for the benefit of the German officers. True enough, we lived on short rations in those years, but having once seen a boatload of these cormorants in various stages of decomposition, going to the factory to be tinned,

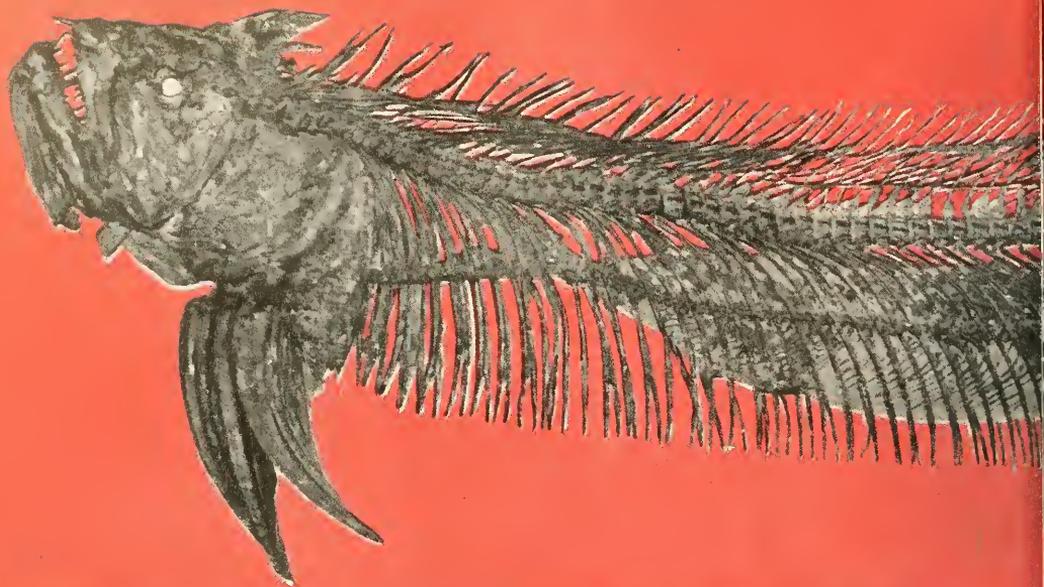
I could not be envious to share in this delicacy. It was practically the only thing I did not begrudge the occupying forces!

These cormorants prefer to nest in trees, but nests are sometimes found on the ground, when complete lack of accommodation for the elevated apartments has forced the birds to build below. These cormorants, like all their relatives, excel at diving and swimming. It is therefore strange to find that nature has not provided them with any means of protecting their plumage against water, such as we find in swans, geese, and ducks. Owing to this peculiarity, we often are treated to the strange sight of a cormorant sitting motionless on a bollard or stone, drying its outstretched wings and looking like

some fantastic heraldic figure.

Bird-minded travelers to Europe may be glad to know that the cormorants continue to nest from March to August, so there is opportunity to visit these wonderful birds throughout the whole spring and summer.

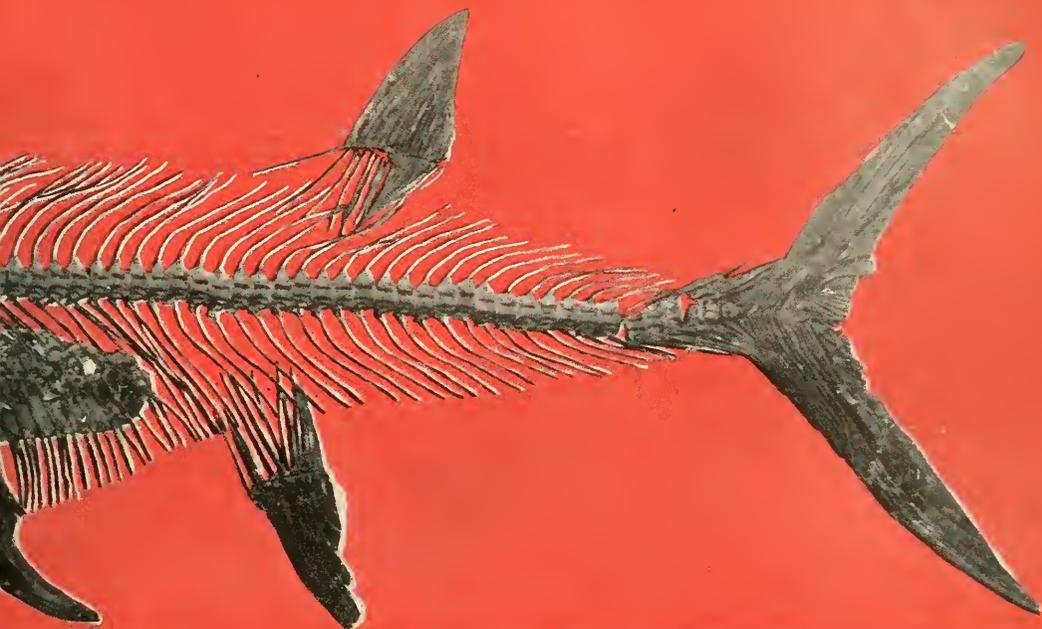
In a cormorant rookery it may be terribly filthy, but it is nevertheless interesting throughout. So when I come home after having spent a day among these birds and my wife says, "Man alive, how did you get so dirty?," I only smile to myself, deposit my waders and clothing in the barn, and take a bath, because my mind's eye still sees that wonderful picture of bird life, a scene unspoiled by the hand of man, so difficult to find elsewhere in this little country of Holland.



▲ HEAD-FIRST DOWN THE THROAT. The fish named *Gillicus*, which *Portheus* swallowed, is clearly seen in the mounted skeleton, above. It is displayed in the Museum of the Fort Hays Kansas State College

▼ IN POSITION where found, the 90-million-year remains of the fish called *Portheus*, which have died soon after swallowing a seven-foot rel





Death after Dinner

A remarkable fossil shows that one fish

swallowed another 90 million years ago, even as today

By BOBB SCHAEFFER

Associate Curator of Fossil Fishes,
The American Museum of Natural History

Photographs courtesy of
Fort Hays Kansas State College Museum

TOWARD the end of the Age of Dinosaurs, part of central North America was covered by a vast sea, which stretched, tongue-like, from the Gulf of Mexico northward into Saskatchewan, Canada. In this unnamed sea and around it, there lived a great variety of animals, some of which were preserved in chalk beds formed on the sea bottom. Western Kansas, in particular, is famous among fossil hunters and paleontologists for its fossil-bearing deposits of chalk. The "Kansas chalk" contains shells of many kinds; fossil oyster beds are

very common. Skeletons of long-extinct fishes are also numerous at some localities. Remains of great swimming reptiles, the flattened, hollow bones of flying reptiles called pterodactyls, and even the skeletons of ancient water birds have been found in the chalk.

Several years ago, the tail of a large extinct fish named *Portheus* was discovered, weathering out of a chalk bank on a ranch in Gove County, Kansas. The painstaking job of uncovering the rest of the specimen was accomplished with great patience and skill by the vet-

eran fossil collector George F. Sternberg of Hays, Kansas. Much to Mr. Sternberg's delight, this practically complete 14-foot *Portheus* contains the remains of the fish's last meal. Clearly evident between his ribs can be seen a seven-foot relative named *Gillicus*, which *Portheus* must have swallowed shortly before dying and falling to the bottom to become fossilized.

Both *Portheus* and *Gillicus* are distantly related to the tarpon. Their only living relative is a long, slender, herringlike fish from the East Indies called the dorab.

Cattle People of th

If you look at a large-scale map of South-West Africa, you will see a thin red line drawn around an area called *The Kaokoveld*. That red line marks the limits of the Police Zone, and no white man may venture beyond it into the forbidden land without a special and very hard-to-get permit. Travel through the Kaokoveld is difficult and dangerous without proper equipment, transportation, and supplies. Even the sturdiest truck



▲ THESE OVAHIMBA WOMEN are laden with beaded ornaments, copper bracelets and anklets, heavy wire necklaces, and skin belts with metal beads riveted on in attractive designs. Skin aprons are worn fore and aft, and a skin cape is tied over one shoulder. The woman at left would not part with her large ivory ornament strung on a bead necklace. It indicated her wealth and high position



Their hostile homeland has protected the ancient ways of the Ovahimbas of South-West Africa, but civilization may soon cause great changes

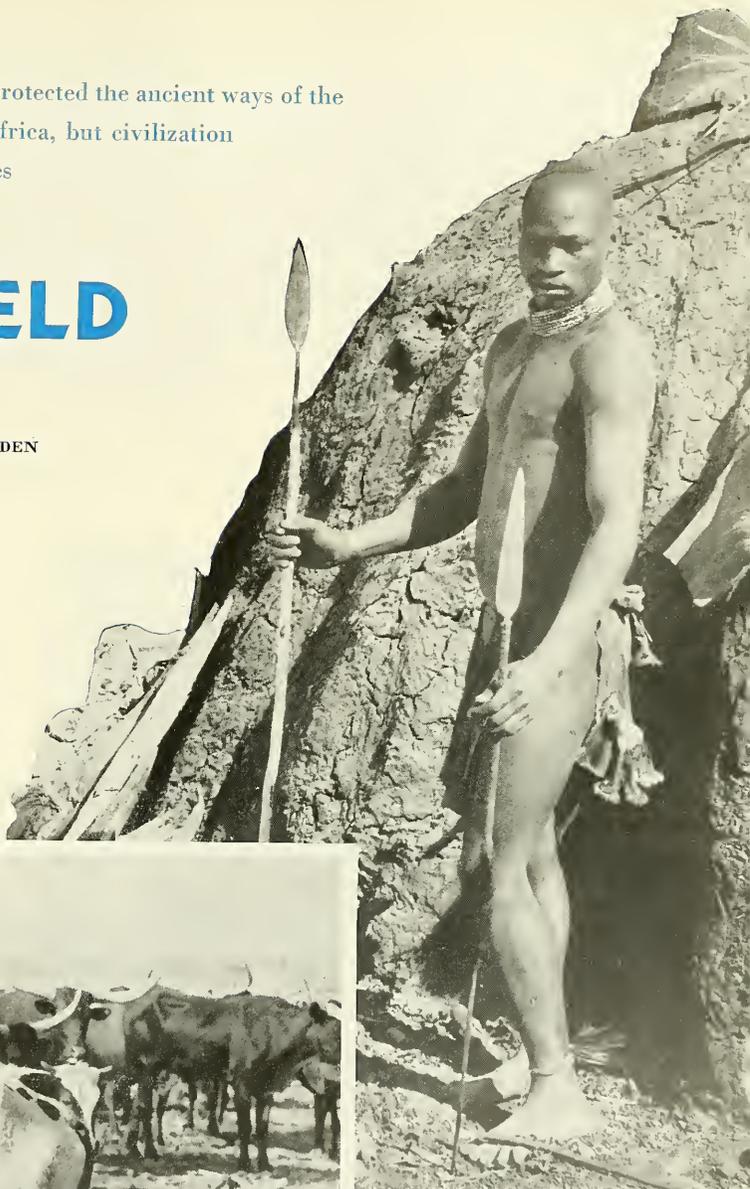
DESERT VELD

By

WILLIAM and IRENE MORDEN

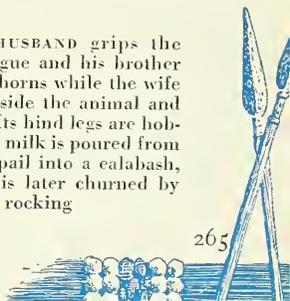
may come to grief in the deep sand. Some early prospectors penetrated into this far corner never to return, and those who did get back to civilization reported unbelievable hardships.

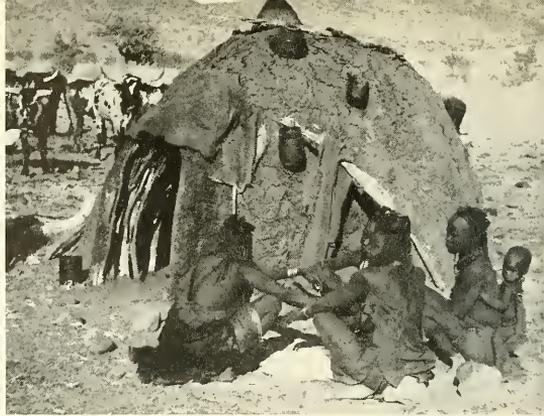
The 1953 Morden African Expedition of the American Museum of Natural History was collecting and photographing last summer in South-West Africa. This rough and beautiful country is a combination of grassland, bush, forest, and



▲ THE OVAHIMBA SPEARMAN uses these short, light-weight weapons

◀ THE HUSBAND grips the cow's tongue and his brother holds its horns while the wife squats beside the animal and milks it. Its hind legs are hobbled. The milk is poured from the skin pail into a calabash, where it is later churned by rhythmic rocking





▲ HOME BUILDING is a joint project. This woman has collected the branches, and her husband has made them into the framework. Lastly, she plasters the hut with a mixture of cow dung and mud.

while he supervises and directs her labors. Hides are sometimes spread over the roof or thrown on the ground as beds. Pails, baskets, and bedding are hung outside to air in the sunlight



a desert coastal strip. Its 318,000 square miles are bounded by three rivers and two deserts. On the south runs the famous Orange River, on the north are two—the swift Kunene, flowing from Angola to the sea, and the broad Okavango, flowing from Angola also, but in the opposite direction to lose itself in the great stands of papyrus that make up the Okavango swamps. The Kalahari Desert lies to the east, and the shores of the

◀ THE OVAHIMBAS have few household possessions. Skin or wooden pails, gourds and calabashes, baskets and wooden stirrers may be homemade but are preferably obtained from traveling Ovombos, an energetic and businesslike people living to the east of the Kaokoveld





WHEN a young man marries, he cuts off his pigtails and presents them to his bride. He thereafter wears none but confines his thick, bushy hair in a metal-beaded headdress

as shown here. He may prefer a fanciful skin turban or leather bands. Men may have more than one wife but the pigtails are presented only to the first or "great" wife

Namib Desert on the west are splashed by the waters of the Atlantic Ocean.

From the Etosha Pan, a salt flat some 1000 square miles in extent, our expedition had traveled to the Kaokoveld for the purpose of collecting mammals, birds, reptiles, and native material. Now we were in an almost barren land, where rainfall was erratic and undependable. Our paths had crossed those of the Ovahimbas, a nomadic peo-

ple who, together with their cousins, the Ovatjimbas, live on the wide, sandy plains of the Kaokoveld. The difference between the cousins is merely a matter of money. The Ovatjimbas are the poor relations, and the Ovahimbas are the rich ones with large herds of cattle.

Long ago from the lakes region of Central Africa it is said that migrations of natives came to various parts of the Kaokoveld. Some

of the people remained in the area between the Kunene River and the little oasis of Sesfontein (Six Fountains) in what is now the Hottentot Reserve. Others continued farther south. Today, three major tribes are represented in the Kaokoveld. They are the Ovambos, the Hottentots, and the Hereros. There are, of course, many offshoots of these so-called "pure" tribes, as intermarriage has occurred and admixtures have resulted. The Ovahimbas and

FOR DAILY WEAR, the women use a small caplike arrangement made of animal skin gathered in folds. Their hair is shaved far back to a sort of tuft, into which are woven long strands of ox tendon or bark. These artificial

"curls" are rubbed with fat and ochre and often decorated with beads. Note how the boy at right has his head shaved to a small circle on top. This tuft is later allowed to grow into two pigtails





▲ **YOUNG MOTHERS** calmly go about their household duties with their babies tied on their backs in skin carriers. The babies ride quietly without raising any vociferous objections to being jolted and joggled. And the small, plump burdens do not seem to impair their mothers' efficiency

the Ovattjimbabes are linked with the Hereros, who are said to be a Hamitic-Negro combination.

The tall, slender 'Himbabes are of a soft brown color, but they rub their bodies with ochre and fat to produce a more reddish hue. The women wear skin skirts, copper arm and leg bands, and skin headresses. They deck themselves out with beaded and ivory ornaments—presumably as much costume jewelry as their husbands can afford. Men have leather aprons held up by plaited leather belts, as well as skin headdresses consisting of a thin piece of animal hide decorated with metal beads drawn tightly over their bushy hair. They wear many copper and beaded ornaments and also file their teeth in the national "tooth-mark" used by the Hereros. This is a triangular notch opening downwards. The two or four permanent teeth in the cen-

▼ **PRIMITIVE FIRE-MAKING.** Ovattjimbabes have seen matches, but these nomads do not possess them. Grit or stone is placed in a hole in soft wood, and two men take turns twirling a fire stick of hard wood in the hole. Dry cow or elephant dung is used as tinder. The third man holds the wood steady and blows on the dung until it blazes. The process takes three or four minutes



ter of the lower jaw are knocked out.

These nomads are constantly searching for suitable grazing for their treasured cattle. Along the Kunene River, where the 'Himbas often wander, the vegetation is subtropical and luxuriant, and the natives find plenty of food to support life. Farther south, in the stony wastes, they must search for water and grass, but those we encountered at Sanitatas and Ombathu seemed to find life pleasant.

Women milk the cattle, carry water and firewood, prepare food, and stamp corn, using a wooden mortar and pestle. Men hunt and supervise the stock and the milking, but they do not manufacture household articles to any extent, as they prefer to buy necessities from Ovambo traders. In this way they obtain their iron and copper. The 'Himbas live as single families functioning as independent units or as



▲ PERHAPS the women's erect and graceful bearing results from walking. This young mother footed it over the stony wastes while her husband and two children rode in style on the family donkey

▼ THIS WELL-DRESSED STRANGER arrived on his donkey he seemed bored in general, he rather relished having his picture taken



small communities of several families with their cattle, goats, donkeys, and dogs. Their dome-shaped or conical huts are made of wattle and dung, with skins thrown on the floor. A small fire may burn in the center of the hut for warmth and cooking. Fire is still made in primitive fashion as you will see from the accompanying picture. The Himba women smear their gourds and baskets with fat to make them watertight, and as their needs are few, their utensils and implements are simple. Men may have one or more wives—largely a question of money. The unmarried youth wears his hair in two pigtails

down his back; and when he marries, he presents the cut-off pigtails to his bride as a wedding gift. This gift, naturally, could be only to the first or "Great" wife.

The Tjimbas are known as the poor ones, who dig food from the earth—the "ant bear people." The wealthy Ovahimbas are known as the "Boasters," because they brag about their sleek and well-fed stock. There are strong class distinctions among these natives, and the cattle owners are the masters. They are a proud and independent people, with comparatively little interest in the white man's doings. They permitted us to photograph them

at their daily chores largely because we had supplied them with zebra meat, but they were unwilling to part with many of their personal belongings for our Museum collections. Although they accepted money for some articles, they also asked that we give them in return some of our bottles, cans, and the like. This was understandable, for cast-off containers are most useful to these primitive people. In giving the Ovahimbas such things as these, we were actually letting our culture impinge upon theirs, as is happening in all parts of Africa today. We were the first American Museum of Natural History expedition to the Kaokoveld, but later comers may find that many changes have taken place even in the space of a few years.

▼ THE PEOPLE ride their donkeys across the stony plains. This man's well-padded saddle, with metal buckles and stirrups, was no doubt obtained from the Ovambos





M. S. Benedict photo, courtesy U. S. Forest Service

▲ LIGHTNING PEAK LOOKOUT, 8538 feet above sea level, a short distance north of the lookout described in this article. This lookout is located in the Payette National Forest in Idaho

**A Vocation
for your Vacation**

The Fire Lookout

The families who guard our National Forests
live close to the stars and far from the haunts of man

By **STEPHEN J. TONSOR**

*All photographs by the author
unless otherwise credited*

SOMETIME this spring, some couple will have gotten a letter from the headquarters of Challis National Forest in central Idaho informing them that they have summer employment as lookouts on Ruffneck Peak (9416 feet in altitude). Having spent three summers there ourselves, my wife and I will envy them and wish them luck and happiness in a home we loved beyond any place we had ever lived.

That first night after the pack train has departed and the air has

turned thin and sharp, the moonlight will invest the great shoulders of the snow-covered mountains with an eerie glow, and blasts of up-mountain wind from the still-warm valleys will shake the lookout cabin. Then they will learn as few people do the elementary human meanings of home and fire and company.

If they are lucky as we were in having children, they will find new freedom from their adult self-consciousness and in the long hours

between sundown and dark will sing together, tell stories, and tumble on the polished hardwood floor.

After dark the stars will burn and crackle almost audibly in a cloudless sky, until suddenly the sun is up again and the mist-filled valleys slowly clearing like pools of roiled water.

Over half their world will be sky, constantly changing. Sometimes great sweeps of gauzy cloud will reach up from behind the Sawtooth, as though to pull the sun out



▲ SUNSET FROM Roughneck Lookout, where the author and his family passed three summers. The nearest neighbor was five miles away

of the sky. Sometimes, mountainous cumulus clouds will go bumping and storming their way across their more phlegmatic earth-bound brothers.

When this year's family puts the first armful of aromatic pine into the tiny stove, I hope its warmth conveys to them the wood-pile magic it had for us. Of all places on the bare mountaintop, the wood pile, weighted with large rocks to keep the great gusts of wind from blowing it away, was the best place for the children to play and for us to sit and read, or just to sit. The seasoned lodgepole pine, honey-colored, had something of the look and feel of the sun and mountain earth and air locked up and awaiting release.

Their nearest neighbor will be five miles away, a prospector who has spent a long time looking for gold where others despaired of finding it. He hasn't found much gold, but his conversation is rich with the life he has lived and the discoveries he has made.

If the man is lucky, he will bring a wife who can transform "victuals" into food and who knows the value

of "prettying up" in a dress that puts a splash of color and excitement into the long gray twilight hours. And if the woman is fortunate, she will have a husband who knows how to make even insecure places feel secure and can read a poem or make a joke as the occasion demands.

Perhaps they will fear boredom and monotony, but how distinct and individual they will find each day. Halfway to heaven, no day is a repetition of another; each is a new beginning. As a city dweller during the other nine months, usually working late into the night, I

sometimes thought that night and day were arbitrary concepts which had lost most of their meaning for modern man. But here night is so vast that no light seems "right" even for small pursuits such as reading. The only thing to do is to go to bed. And contrarywise, sleeping during the long exciting day seemed nearly as unthinkable as it would be for the tiny animals that remain ever watchful for the shadow of the hawk.

The single line of connection with the outside world is the telephone. The Operator, the Ranger, and the Fire Dispatcher, invisible to us, all take on qualities of personality after a while, much in the way in which a multitude of impressions inform the blind of their fellow men.

Some night I hope our successors happen to step out onto the catwalk and see the Great Bear measuring a wide arc of the northern sky. Perhaps a meteor will flash out of the commonplace of darkness for a moment, and then suddenly a boulder will slip from its footing on a mountain side somewhere and thunder into the valley below. Minutes after the great noise has died away, they will hear the smaller rocks slipping and sliding away into oblivion; and then silence.



► THE AUTHOR'S DAUGHTER Ann looking from the Ranger Station at Stanley, Idaho, toward the Sawtooth Mountains, which flank the Challis National Forest on the west



▲ THE INTERIOR of the Roughneck Peak Lookout. Note the battery-operated light over the dinner table, which is set for the evening meal



Courtesy U. S. Forest Service, Department of the Interior

▲ THE LOOKOUT on Roughneck Peak in central Idaho. Since this photograph was taken, a cat-walk has been built around the building



THE FIRE LOOKOUT



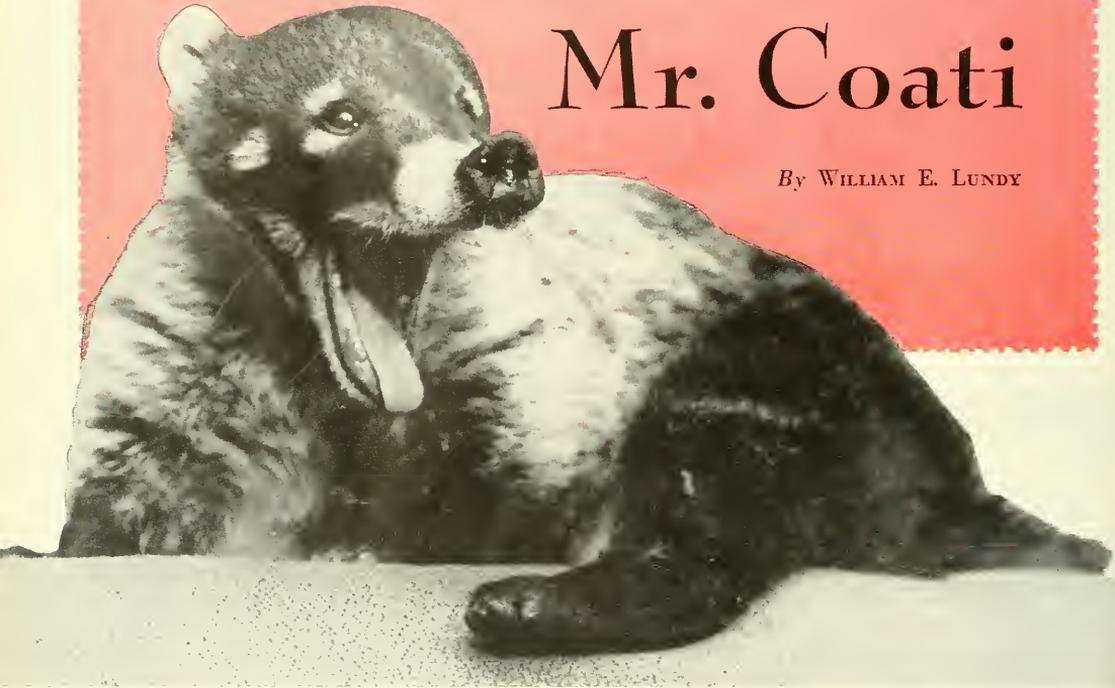
◀ ANN TONSOR, riding with the Ranger Alternate on the trail that leads up to the Lookout

▲ THE EVENING BATH. Throughout the summer, melting snow provided the water for drinking and washing!

He usually goes his own wild way —
and sometimes you wish he only would

Mr. Coati

By WILLIAM E. LUNDY



Roland Patterson photo from *Black Star*

▲ HE TURNS his rubbery snout from side to side or upward with ease

IT WAS near lunchtime of the first day of my first trip to the biological station on Barro Colorado Island in the Canal Zone. From the kitchen drifted aromas of things to come—*sopa, fruto-pan,* and *carne asada* (soup, baked breadfruit, and roast beef). All would be highly but deliciously seasoned, no doubt, as is usually the case with good Spanish cooking.

My appetite did not need this encouragement, for I had had an early breakfast, and, furthermore, in those days I was young.

While I waited for the dinner gong to sound, I reread parts of a letter from Dr. James Zetek, Curator of the Island, in which he had

given me permission to make a long-anticipated visit to Barro Colorado. "Dr. Chapman is on the Island," it said. "You will locate yourself in the main lab upstairs. You will have Tom Gilliard for companion there. He is Dr. Chapman's assistant. Introduce yourself . . ."

I had read *My Tropical Air Castle* and other books by Dr. Chapman and looked forward to meeting him. My speculation as to what the famous bird scientist and his young assistant would be like ended abruptly when, exactly at the sound of the gong, two men approached the dining room. One came from the direction of his "Air Castle," the

other from the entrance to Snyder-Molino trail. Later I learned that Dr. Chapman was very punctual at mealtimes, demanding that they be served on the minute. I learned also that Gilliard, who was younger than I, maneuvered to be within hearing whenever the dinner gong sounded.

As the introductions ended, my attention was attracted by something moving at the edge of the clearing. Slowly there emerged from the jungle a large coati-mundi. It cautiously approached the kitchen, halting every few steps to sniff the air and casting furtive glances in our direction.

I expressed surprise that it had not

dashed back into the jungle at first sight of us, for until that time my acquaintance with coatis had been limited to glimpses of them in unprotected areas as they rushed for cover. Dr. Chapman, who had hardly glanced at the coati replied, "Ordinarily they are quite common around the laboratory, but this happens to be their mating season, and they apparently have more important things to attend to in the jungle."

From a distance the coati's size, color, and general appearance reminded me of a large raccoon; but as it came closer, I noticed that its legs seemed shorter, its body stouter, its eyes closer together. The long narrow nose ended in a snout, which it moved from side to side or turned upward with ease. More noticeable was the long black-banded tail which, instead of being fluffy, had short hair and was carried perpendicularly, with a few inches at the tip bent slightly forward.

With its sleek and glossy coat, marred only by a deep gash behind the right shoulder, it was one of the finest coatis I have ever seen.

The three of us had just settled

into our seats for lunch when Dr. Chapman, his full soup spoon poised in midair, began, "While I was visiting Lord Grey at Fallodon, he said to me one day . . ." The story was cut short by a shriek from the kitchen, "*Viene José! Doctor! Viene José!*" This was followed by a second voice which yelled, "*Esta José! Esta José!*"

Soup splashed in all directions as Dr. Chapman, dropping his spoon, grabbed a handful of bread and made a mad dash for the door. "Bring bananas! Bring bananas for José!" he called in a voice high-pitched with excitement. Tom was close behind him with the bananas, snatched from a bunch hanging within the dining room.

I had not been on the island long enough to learn the various personages by name, but a little knowledge of Spanish told me that José was coming—in fact, that José had arrived! And by the excitement that his return was causing, I felt sure that if a fattened calf were available, there would be veal for supper.

Quickly I followed the others, my curiosity aroused, to meet the prodigal.

José was just another coati, and

a very shopworn individual at that. He was old, disheveled, practically blind, obviously groggy, and probably senile. With his tail dragging the ground—an indication in a coati of utter defeat—José was indeed a deplorable sight!

The young, handsome coati that we had seen earlier was still in the clearing, and I could not help but contrast it with José, who, after much coaxing, was accepting a banana from the hands of Dr. Chapman.

"Why," I asked, "do you feed this one and ignore that fine-looking fellow over there?" A withering look from Dr. Chapman was his only reply. The others remained silent.

When José had eaten and dragged himself back into the jungle, we returned to the long-cold soup. I did not learn what Lord Grey had said at Fallodon, but I did learn that this particular coati was fast becoming a chapter in Dr. Chapman's next publication, *Life in an Air Castle*. It was my unspoken opinion that José had reached the next to last paragraph of that chapter.

Many months earlier, Dr. Chapman had singled out this coati for

▼ TAKING HIS OWN PICTURE: José, a coati made famous in the writings of the late Frank M. Chapman

AMNH photo





▼ CAPTURED YOUNG, a coati may share your pillow, but don't expect him to become a disciplined pet

Photo by P. R. Houghton

special observation. At that time, according to witnesses, José was a splendid specimen of coati youth. Not one scar detracted from his appearance. Then one day late in January the breeze bore to José's nostrils a fragrance so alluring that all the ripe bananas and other special tidbits seemed as nothing; and deserting the clearing, he answered the age-old urge to take a mate.

It was quite obvious when he returned two and a half weeks later that unless his rival or rivals were *dead*, José had emerged from the contest second best.

He had fared even worse a year later when he went on his second courting spree, which left him in such a pitiable condition that Dr. Chapman was begged, unsuccessfully, to put the animal out of its misery.

All this I learned before Dr. Chapman returned to his meal in earnest.

Now we had witnessed José's return from the third sally, in what appeared to be a dying condition.

Thinking out loud, I said, "From youth to senility in just two years and two months, covering only three mating periods! Compared to man, each of these two-week periods has aged José by something over 20 years." The native helper, who had announced José's arrival—understanding English but refusing to speak it—murmured, "A

mé parece que no vale la pena!" To him it seemed that José's escapades were not worth the penalty he was paying!

A few days later, José was seen leaving the clearing, where he had been fed and protected, half-dragging himself into the cool of the jungle. When days passed and he failed to return, the chapter was concluded.

What the life span is for coatis under normal conditions, I do not know. Surely, in the case of the males, it must be considerably shortened by their terrific fighting during the mating seasons.

Although coatis visit the laboratory in search of handouts from the kitchen, they remain wild. A few are tame to the extent that they will accept food from the hands of man, all the while ready to spring away should a false move be detected. And two battered old males finally accepted the asylum of a man's cabin in preference to almost certain death at the hands of younger coati males.

When captured young, they tame easily; but if given the run of a house, they may be found with their paws in the sugar bowl or cream pitcher.

One young female coati became so attached to her captor that she often shared his pillow. As she grew older, she went more and more often into the jungles and stayed for longer and longer periods. Eventually she remained permanently with her kind.

Ask a native bushman for information about a *Nasua narica panamensis* and he will shake his head as though to say, "It's all Greek to me." Mention a coati-mundi, and you will get no more than a blank stare. But speak of a "Gato Solo" (Lone Cat), and the native will either grin and tell of the cunning and strength of the "Gato" or frown and tell of its destruction to his crop of maize.

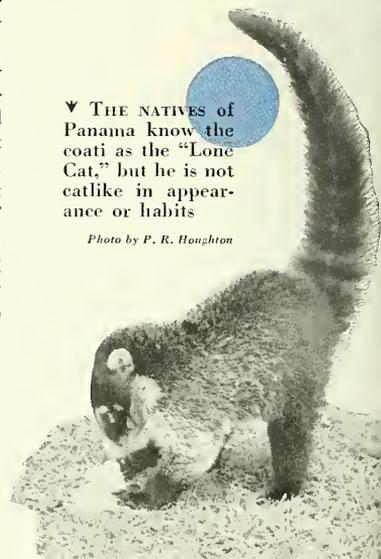
Doubtless the "Lone" half of the name comes from the habit of the male to travel alone. How they came to be called "Cats" is a mystery, for they are not of the cat

family, nor do they have any of a cat's characteristics.

On Barro Colorado one carries a *palo* (stick or cane) to assist in climbing steep and sometimes slippery trails. My *palo*, a sawed-off broomstick with a spike in one end, has saved me from many a slip or fall. On two occasions I thought that I might be forced to use it as a spear.

For more than an hour I had been snooping into the personal affairs of a band of Howler Monkeys. Except for the incessant *zing* of insect voices and the sound of wild figs being dropped by the monkeys onto the dry leaves below, the morning was unusually quiet.

Tucked away in my pocket were two ripe bananas I had brought along for a midmorning snack. Perhaps their odor had reached the nostrils of a hungry animal, for suddenly I realized that something was coming directly toward me, and coming fast. The noise made by the dead leaves through which the animal was rushing caused me to imagine that it had to be as large as a tapir, and I braced myself, with the spiked end of my *palo* poised for defense. For a second my spine tingled and my scalp crept; then a coati broke through the underbrush, almost at my feet, and "froze." I already had! These moments of intense suspense, which almost invariably end harmlessly,



▼ THE NATIVES OF Panama know the coati as the "Lone Cat," but he is not catlike in appearance or habits

Photo by P. R. Houghton

add greatly to the fascination of jungle prowling.

A split-moment later, the coati whirled about and dashed down the hillside in the direction of Shannon Creek.

One sultry dry-season day I laid my palo on the ground before squatting beside the decaying corpse of what had been a towering jungle giant. Some news must travel fast through the jungles, for almost in a twinkle four beautifully iridescent scarab beetles arrived. They entered into their work with such diligence that they seemed out of place in this "Land of Mañana."

The ground was covered with leaves so dry that Cooper's Deer-slayer could hardly have taken two noiseless steps among them. I had become so engrossed with the activities of the scarabs, however, that a band of foraging coatis came within 20 yards before I became conscious of the noise they were making. And coatis take no blue ribbons for quiet foraging!

Emerging from a rather heavy growth of underbrush, the coatis were crossing a space comparatively



free of bush, giving me an excellent opportunity to observe them without their knowing that they were being watched.

I counted four adult females and seventeen young, about one-third grown, as they moved forward, spaced from one to two feet apart, presenting a broad front.

With their tails held stiffly erect,

▲ VARIOUS FOOD-GETTING PROBLEMS were presented to José to test his ingenuity, and he came out well

▼ COATIS SEEK their food on the forest floor and high in the tropic trees. They eat all manner of smaller creatures and grunt like pigs with clothespins on their noses





▲ A COATI adorns a stamp commemorating the Canal Zone Biological Area's 25th Anniversary

they came slowly in my direction, scattering dead leaves, overturning debris, tearing apart rotted limbs, digging around old stumps, sticking their long noses into any crevices or holes that they found. I wondered what would happen if a large scorpion or a fer-de-lance chanced to be at home in one of those places. Several of the coatis stopped to dig roots of small plants, while others dug swiftly for a moment to unearth some juicy grub, worm, or other choice bit of food that their sensitive noses had located. A tiny frog, frightened from its daytime hideaway at the base of a tree fern, jumped frantically away. Two of the young coatis, in hot pursuit, collided. A short, sharp, and noisy fight ensued, while a third coati ate the frog, which it had caught on the bounce. So thoroughly were the coatis stripping the area that I remembered Dr. R. K. Enders' words: "How any bird or rodent survives is a source of wonder, for the coati is tireless and cunning."

Closer and closer they came to where I was squatting, and I could now hear low noises, as though a group of small pigs were trying to grunt with clothespins clamped over their nostrils.

It seemed that if I continued quietly minding my own business, the band would pass by, with the nearest coati only a few yards to my left.

There seemed to be no fear of possible danger as they moved noisily along. Some believe that coatis depend almost entirely upon a keen sense of smell to warn them of near-by enemies, yet I have

sometimes found myself within a few feet of a coati before it was aware of my presence.

What the warning had been, I do not know, but when the distance between me and the coatis had been reduced to about eight yards, they recoiled as though snapped backward by a single spring and dashed back to the edge of the heavy underbrush, leaving only two of the adult females near me. Holding their heads high and sniffing the air, these two spotted me within a matter of seconds. Their muffled grunts became louder and faster, and mounting the log, they began a series of short advances and shorter retreats. Each advance brought them a foot or two closer.

Believing that if I remained motionless they would satisfy their curiosity about me and return to the band, I waited. I had not once thought that they might attack, until their grunts turned to snarls and their lips curled back, displaying formidable sets of teeth.

When I realized that the next advance would bring them within arm's reach, an easy springing distance, a cold shiver ran up my spine. Retreat was impossible! Grabbing the palo, I sprang to my feet and swung it savagely in an arc over the head of the nearest coati.

My sudden attack must have surprised them as much as their threatened attack had surprised me, for in their haste to retreat, both of the animals fell off the log and hit the ground running.

Had I known at that time that Dr. Van Tyne had twice had to defend himself against coati mothers, I would have taken action much earlier.

I would not give the impression that one is in constant danger of attack by coatis on the island. I know of only one attack that was not made by a mother defending her young. Noticing that a certain male coati became angered at the sound of rattling keys, a man had provoked the attack by "jingling" a bunch of keys over its head. The coati sprang upon him and sank its teeth into his shoulder.

One noon I was sitting on a shaded rock in the bed of a small stream, munching on a thick sandwich. It was a poor substitute for the hot meal that was being served at the laboratory, but it saved me considerable trail climbing and added to the time I could spend alone in the jungle.

Ordinarily there is little activity among the wild animals at that time of day, and I had relaxed my vigilance, when a movement on the right bank drew my attention.

A coati, rather small to be traveling alone, was coming down a steep game trail, which had been cut into the bank by many years of animal traffic. Reaching the water's edge, the coati hopped from stone to stone, crossing the shallow stream without wetting its feet.

Following it with my binoculars, I saw it pause; then it sprang a few feet in my direction and pounced upon a small dark object that was moving toward a hole in the bank, well above the high-water mark.

Holding the object at arm's length, the coati seemed to be rolling it on the ground, bearing down as he did so. This continued for some 30 seconds. Tentatively raising its paws, the coati sniffed at the now motionless object and then began to eat.

Having soon finished the morsel, the coati returned to the game trail and disappeared over the left bank, leaving behind only enough evidence to identify the victim—the two sharp, rose-thorn shaped fangs of a large tarantula. There is a record of one coati having dug a hole 32 inches deep and 14 inches wide to unearth one of those hairy creatures. In that case also, only the fangs remained uneaten.

Coatis are not choosy about their diet. Remnants of insects and insect larvae, roots, rodents, star apples, pineapples, wild figs, espavé beans, bananas, papayas, palm nuts, and *almondro* nuts have all been found in their stomachs, and they greedily devour almost any scraps thrown to them from the kitchen. Without doubt they also eat birds' eggs and young birds.

One coati enthusiast spoke of them as "the most arboreal terrestrial animals" he had ever known, for they appear quite as much at home in the trees as they do on the ground. The *almendro* nut, one of their favorite foods, is gathered at the ends of boughs often 100 feet or more above ground.

Although they climb with the ease of a monkey, I have never seen one cross from one limb to another by jumping. Always they return to the trunk and climb to the other limb. When climbing vines or branches small enough to grip, coatis use the hand-over-hand method, but on trunks of larger diameter they "hunch" upward, one end at a time, giving the impression of a huge, fat inchworm.

Dr. Chapman's attempts to build a coati-proof feeding board on which to keep bananas for birds led to some interesting observations. Sooner or later a coati would get to the bananas.

Finally a tray was hung from wires stretched between the "Air Castle" balcony and a near-by tree. It was equipped with pulley and cord with which to manipulate the

tray. But soon the coatis were mounting the balcony and pulling the tray in with a hand-over-hand motion, quite as dexterously as did the Doctor himself. When the balcony was guarded, the coatis climbed the tree to which the wires were attached and walked the wires to the tray.

Then a guard of sheet zinc was built around the tree trunk *below* the wires. This, for a short time, seemed to be a winner. How José got the banana was told by Dr. Chapman as follows: "But, so far as I know, José never tried to pass this obstacle. His familiarity with the surroundings taught him a better way. Going 30 feet farther into the forest, he climbed another tree to a point where its branches touched those of the tray tree, crossed to it, and slid down it to the point above the guard where the trolley was attached and, as before, slid out on the wires to the tray and the tangers' banana."

There has been considerable difference of opinion regarding this experiment. It seems clear that Dr. Chapman believed that José *solved* the problem, for later he referred

to that coati as "... an animal of such unquestionable intelligence." Others, however, are inclined to believe that it was purely coincidental and that, after climbing another tree, José found himself by chance in a position to reach the wires from above.

At the time that Barro Colorado Island was made into a wildlife preserve, there were probably no more coatis on it than there were in other jungle areas of comparable size. But protected here from Indian, Bush Negro, and Jamaican hunters, who use them as food, the coatis have multiplied rapidly.

Today the coati is seen more often than any other inhabitant of the Island. I once counted 22 in the clearing at one time. Here they delight visitors by walking a tight wire and using their long tails as balancing poles to reach bits of food. And anyone roaming the island may reasonably expect to meet them on any of the widely scattered trails.

It is not surprising, then, that on the ten-cent postage stamp, commemorating the twenty-fifth anniversary of the Canal Zone Biological Area, there is to be seen, superimposed upon a map of Barro Colorado Island in Gatun Lake, the portrait of a coati.



◀ COGO CALABASH OF BANDER SNATCH, as this coati was named, would lie down with the dog

Roland Patterson photo from Black Star

This spectacular geologic formation is the basis for a state park in the Silver State

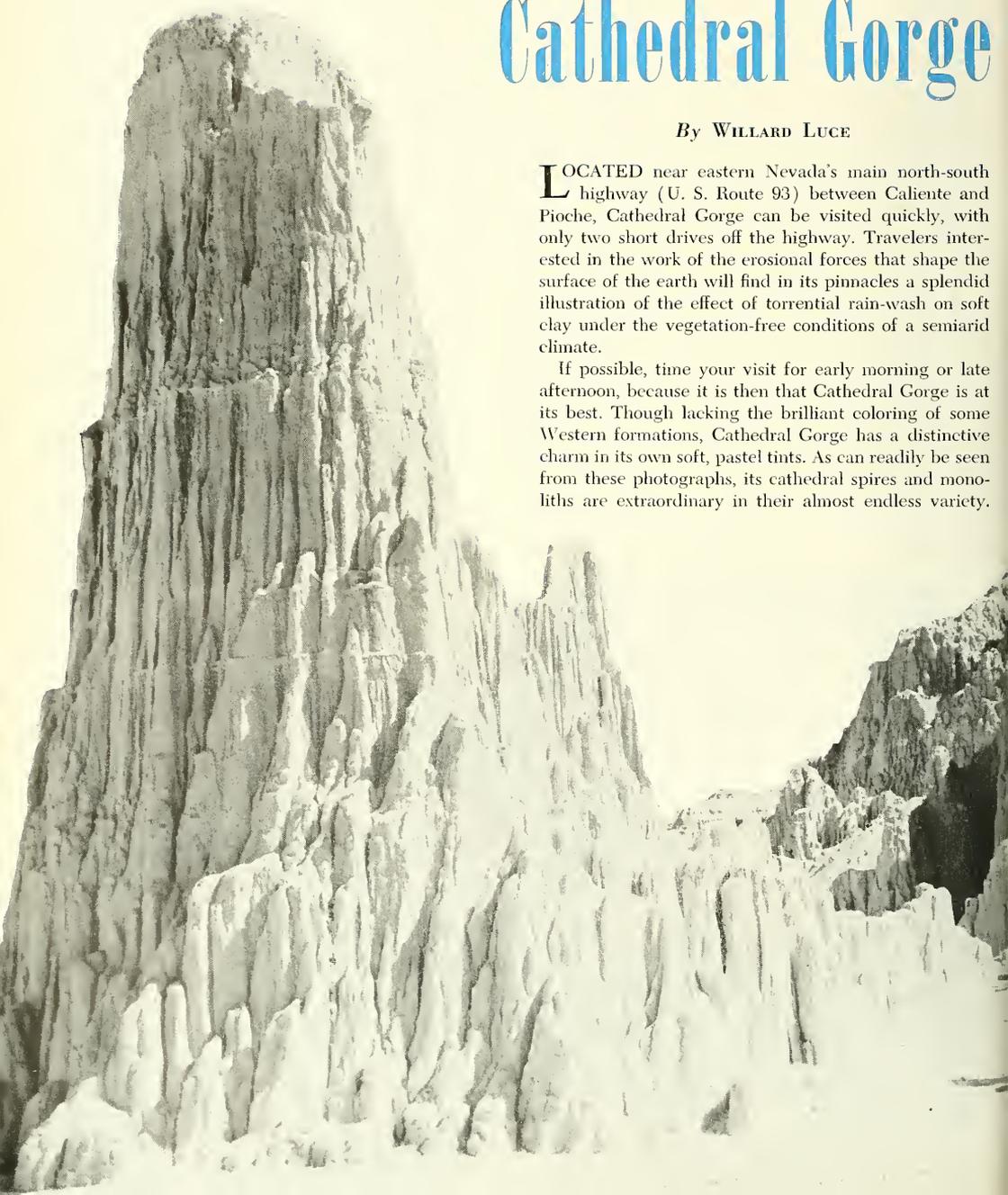
NEVADA'S

Cathedral Gorge

By WILLARD LUCE

LOCATED near eastern Nevada's main north-south highway (U. S. Route 93) between Caliente and Pioche, Cathedral Gorge can be visited quickly, with only two short drives off the highway. Travelers interested in the work of the erosional forces that shape the surface of the earth will find in its pinnacles a splendid illustration of the effect of torrential rain-wash on soft clay under the vegetation-free conditions of a semiarid climate.

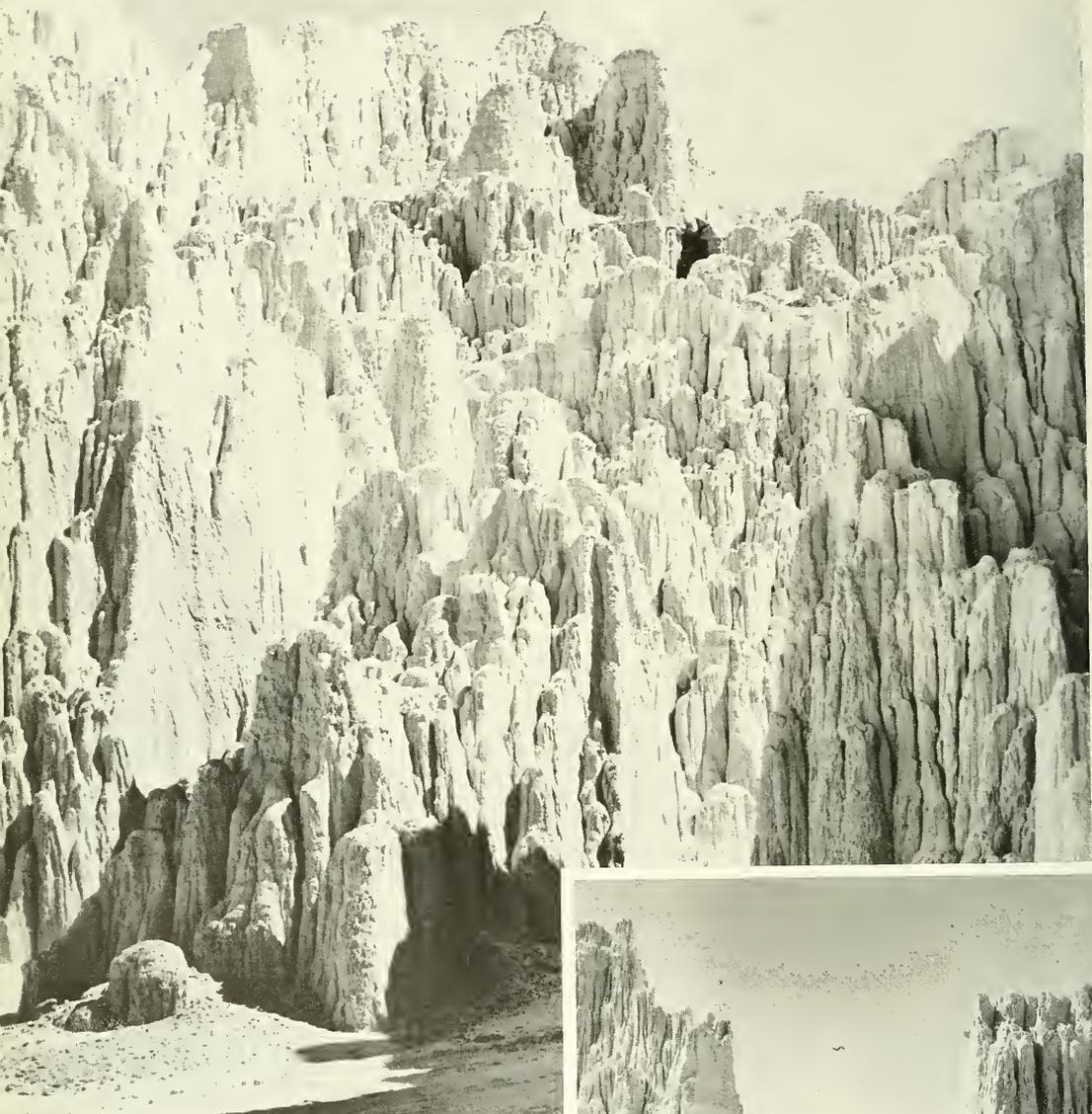
If possible, time your visit for early morning or late afternoon, because it is then that Cathedral Gorge is at its best. Though lacking the brilliant coloring of some Western formations, Cathedral Gorge has a distinctive charm in its own soft, pastel tints. As can readily be seen from these photographs, its cathedral spires and monoliths are extraordinary in their almost endless variety.





TOWER, with its intricate tracery, is one of the outstanding
s of the Gorge. Near it are the picnic shelter and rest rooms.
torists who prefer not to lunch by the highway, Cathedral Gorge
a weird and instructive setting

▲ LIKE the flying buttresses of a Gothic
cathedral, the vertical fins extending
from this bastion cast intricate shadows
in the slanting rays of the sun



^ EVEN THE OWL on the skyline seems fascinated by the countless weird forms that make up Cathedral Gorge

> THIS TOWER was erected in connection with picnicking spots and hydrants. In the top of the tower is a water storage tank, but at present there is no water at the Gorge, and it is no longer in use





▲ RANGING from white through cream and buff to brown, the sculpturing of Cathedral Gorge presents walls such as these throughout much of its two-mile length

▼ BEWILDERING in its infinite shapes: a view of Cathedral Gorge from the east wall





Strange Uses for Insects

Since man made his appearance on earth, insects and the products of insects have in many ways, become inextricably integrated with his cultural patterns. These are a few

▲ *The Japanese make an exquisitely formed, beautifully painted kite in the likeness of the cicada, which they customarily fly in kite-flying contests at their New Year's festivals.*

★ ★ ★

Honey is sometimes used cosmetically in hand creams and other toilet preparations because it is reputed to have a nourishing, bleaching, astringent, and antiseptic effect on the skin.

★ ★ ★

▼ *In China, cricket fighting is a popular sport. A pair of tiny scales is used to weigh-in the contestants because there are heavy, middleweight, and lightweight classes.*

Ancient goldsmiths in all parts of the world used beeswax to perfect a process for the casting of metal objects, especially gold. This was the basis for the present-day dry metal-casting industry.

★ ★ ★

Bees collect a sticky exudation from the resinous buds and limbs of trees, known as propolis. It has been used in the preparation of varnish, as a wood polisher, to give a golden color to tin, and to make fumigating cones for perfuming rooms or halls.

★ ★ ★

Beeswax is occasionally used in cosmetics and candles, and during World War II it was an essential war material. It has over 100 important military uses, including the coating of shells, bullets, and airplane wings.

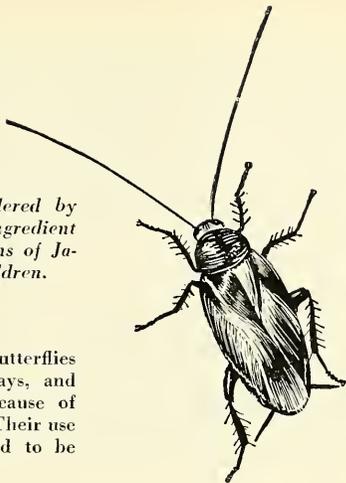
★ ★ ★

An insect injury to certain plants produces gall nuts. These nuts are used as a basic dye ingredient for tattooing in East Africa.

★ ★ ★

Commercial use of insects that provide lac was at one time widespread. Lac was the basic ingredient of stiffening agents in the toes and soles of shoes, and in felt, fur, and composition hats. It has been used in shoe polishes, artificial fruits and flowers, lithographic ink, electrical insulation, protective coverings for wood, paper, metal, fabric; in wax emulsions, wood filler, sealing wax, buttons, and numerous other articles.





► *Cockroaches have been considered by some people to be an important ingredient for special medicines. The Indians of Jamaica use it to kill worms in children.*

★ ★ ★

The South American Morpho butterflies are used in making jewelry, trays, and framed miniature silhouettes because of their brilliantly iridescent wings. Their use was so widespread that laws had to be passed to protect them.



◀ *Many persons afflicted with rheumatic disorders have dangerously allowed themselves to be stung by honeybees, hoping for relief.*

★ ★ ★

Insects are used as a test of endurance in the Pomeroon district of British Guiana in South America. When an Arawak girl attains womanhood, an "ant-frame" holding many large, biting ants, is placed on her head, hands, and feet. It is believed that passing this test of fortitude is evidence that she will henceforth have strength and willingness to work. Some have endured until death!

★ ★ ★

► *Prehistoric man collected wild honey as food, as shown by this picture from a cave in France.*

★ ★ ★

Years ago, "Cantharides" or "Blister Beetles," also known for generations as "Spanish Fly," were extensively used as an ingredient for "love potions." However, the quantity necessary to produce appreciable results causes severe internal inflammation and is very dangerous to life. Today the substance is mainly used as an ingredient of many hair tonics, and veterinarians use it for purposes of breeding.



Excerpts from Lucy Clausen's *Insect Fact and Folklore* soon to be published by The Macmillan Company

Reading for Summer Rambling

August on Fire Island Beach

Less than 50 miles from New York City lies an unspoiled, primitive beach whose fascinating wildlife and topography are here presented in an absorbingly interesting manner by Robert Cushman Murphy. The visitor to Fire Island—or to any northeastern beach—will find his enjoyment of the trip greatly enhanced by this intimate insight into life by the sea. Illustrated.

45¢ postpaid

The Life History of the Monarch Butterfly

This vivid butterfly, found during the summer on Fire Island as well as in other areas of the northern latitudes, is here described at length, with each life stage illustrated. 40¢ postpaid

The Story of the Landscape

In its description of a rural area near Stissing Mountain, just 90 miles north of New York City, this booklet dips beneath the superficial enjoyment of a lovely landscape and graphically explains the interdependence between plant and animal life and their environment. Its conservation message is broadly applicable and of interest to the general reader of almost every locality. 70¢ postpaid

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MAN AND NATURE
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American Museum of Natural History
New York 24, N. Y.

original and helpful feature. Finally, in order to serve despite the crossing of political borders, the English vernacular name of every species is reinforced by the Dutch, German, French, and Swedish names.

Even a rapid thumbing through the pages and plates of this little book affords a highly educational experience with reference to the resemblances and differences between the avifaunas of Europe and North America. A proportion of the same or nearly identical birds are shared. Another good-sized group is made up of ecological analogues. Certain large American families of tropical origin are entirely missing in Europe which, on the other hand, provides compensation in its har-

riers, bustards, sandgrouse, courser, ruff, lapwing, partridges, black grouse, capercaillie, bee-eater, roller, hoopoe, wall creepers, Old World warblers, and accentrors.

The bibliography lists the most useful books on birds of the continent in general, and of a score of European countries.

R. C. M.

CULTURE AND PERSONALITY

----- by John J. Honigmann

Harper and Bros., \$5.00
499 pp.

FOR the twenty-odd years since "culture and personality" crystallized as an area of study and research, this field has

remained almost a complete mystery to the general public. In fact, not a few professional anthropologists have claimed, somewhat irritably, that it was beyond them as well. The explanation of this state of affairs is not difficult to find. Although some of the chief exponents of this field of study—such as Ruth Benedict and Margaret Mead—have written lucid, semi-popular books on one aspect of this subject or another, Honigmann's fine book is the first to deal with the field in its entirety.

This has meant a painstaking combining of the literature of anthropology, sociology, psychology and psychiatry, for "culture and personality" is one of the so-called interdisciplinary studies. Since most of the material is highly technical, involving several specialized jargons, it is



▲ Group of Tibetan officials in Lhasa with Lowell Thomas



The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

◀ INSIDE a temple of the Sera Monastery. The proctor (left) and monks listen, while the monk in right background chants a prayer

▲ THE POTALA, winter palace of the Dalai Lama in Lhasa, is higher than the Woolworth Building

nothing short of a miracle that Honigmann has managed to make his book clear and readable, and intelligible to any adult, professional or otherwise.

Very briefly, culture and personality as a field of study deals with the individual in culture, how he learns to become a Samoan, a Navaho, or a Chinese, how he is molded by the forces of his society, and how he becomes a neurotic or a well-adjusted human, depending upon a complex series of interacting factors. It seems to me that this is truly the dynamic side of social anthropology, and that if we are ever to make a sane and intelligent adjustment to the world we live in, the findings of culture and personality have much to offer us. The utility of these findings in the fields of mental health and in the administration of non-European groups is

now recognized internationally. This is a book to read and re-read with thought and reflection.

HARRY TSCHOPK, JR.

CLARENCE.

THE LIFE OF A SPARROW

----- by Clare Kippes

C. P. Putnam's Sons, \$2.50
127 pp., 8 pls.

THIS is a story of the author's 12-year association with a House Sparrow in her home in England. Picked up after it had fallen from the nest, crippled in one wing and one leg, it was kept until, after illnesses, it died from old age. The author's undoubted affection for her pet is evident throughout, and it is probable

that this has led to the highly anthropomorphic interpretations that are placed on most of the bird's actions. However, even without such interpretation, many of "Clarence's" reported actions are difficult to accept unequivocally.

Being reared away from all contacts with his own kind (except casually sometime later) and dependent on his mistress for everything, he apparently accommodated himself to his unusual environment in ways at variance with the normal behavior of his wild brethren. Some of the activities possibly were due to his crippled wing and leg and not to any superior avian intelligence.

The story as it is told is pleasantly written and not without interest, but it is difficult to accept it as a meticulous study in bird behavior.

J. T. ZIMMER

"Out of This World"

Reviewed by HAROLD E. ANTHONY

Deputy Director,
Chairman and Curator of the Dept. of Mammals,
American Museum of Natural History

THERE can be little doubt that this is the best color film of Tibet that has been made available to the public. There

is also the likelihood that much of what is shown has never been photographed before. The commentary that runs with the film, given mostly by Lowell Thomas, Jr., with occasional help from his father, makes rather sweeping claims as to "firsts," "never done before's," physical hardships, and so forth, but the film

speaks for itself and the average person will not be troubled by some of the extravagant accompaniment.

The film is well edited, and the continuity is first rate. The story of their visit to Lhasa is given in simple, chronological fashion. The trip was made on invitation from the Dalai Lama's government with the purpose of getting back to the United States some expression of friendship from Tibet. On this basis the Thomas party had co-operation and opportunities to photograph activities hitherto prohibited to foreigners.

The journey from India up over the Himalayan passes and high plateaus is well portrayed. There is considerable color and interest attached to the early stages of this trip, which has been photographed by other occidental travelers, so the unique aspects of the film do not appear until the Thomases reach Lhasa and are permitted to photograph persons in the high echelons of government and religion and engage in the rather intimate community affairs peculiar to Tibet. With the advent of the Red Chinese domination, there will almost certainly be changes in these affairs, and perhaps the photographic record secured by the Thomases will be the only one of its kind.

"Out of This World" is instructive and entertaining; it is unusual and tells a story. This reviewer could have done with a little less window-dressing in the commentary, but nowadays one has come to expect a certain amount of this in journalism and pictures.

This film is being released by Leonard Spinrad.

Brief comments on films previously reviewed

Documentary and Grade A

What the Experts Said

Annapurna

The ascent of the now-famous mountain

Beautiful and deeply moving film

Conquest of Everest

One of the greatest achievements in the history of exploration magnificently filmed

Stirring epic from on-the-spot material

The Living Desert

Disney's first feature-length True-life Adventure film, showing animal and plant life in the Great American Desert

Marvels disclosed in this film must be seen before one can sense full significance

Down the Alphabet

Elephant Walk

Life on a Ceylon tea plantation

Elephants and cast put on a good performance

Hell Below Zero

A sock-and-slug drama, laid in the Antarctic

Operations of a whale factory-ship vividly and accurately portrayed

The Naked Jungle

Story of a Brazilian plantation owner's efforts to get a wife and his struggle against the elements

An entertaining melodrama with some unnatural history. Not filmed on location

2000 feet and were named *Typhloperipatus williamsoni*.

LIEUT.-COLONEL F. M. BAILEY, C.I.E.
Stiffkey, Norfolk, England

Voodoo

SIRS:

I was very much interested in your

article, "The Truth About Voodoo," which appeared in the April issue of NATURAL HISTORY . . .

CYRUS F. JUDSON, JR.
Advertising Manager

Alcoa Steamship Co., Inc.
New York, N. Y.

Adventurous Vacation

SIRS:

I received the April copy of NATURAL

HISTORY and upon reading it through feel compelled to write you.

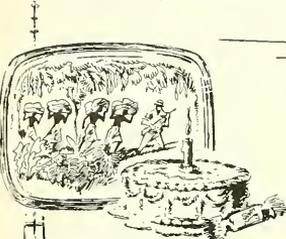
As a layman whose only interest in science is natural curiosity, I appreciated Bernice Goetz's article "Trail Riding in the Wilderness," for it not only touched upon "adventure," but also a practical suggestion for this summer's vacation. . . .

NORMAN J. ADISE

Brooklyn, N. Y.

A Year of

ADVENTURE



ON May 9, "Adventure," the weekly television program by CBS-TV with the co-operation of The American Museum of Natural History, celebrated its first anniversary. Many readers of NATURAL HISTORY are familiar with the series, which originated in the mind of the Museum's President, Alexander M. White. When Mr. White was elected President in 1951, he immediately initiated plans to bring the story of the Museum to television viewers throughout the country. When approached by Museum representatives, officials of CBS-TV had the vision to foresee the exciting future of a television show based on the Museum's vast resources. Today some 3,000,000 persons see the show each Sunday afternoon at 5 o'clock D.S.T.

Perhaps it is good at a time like this to take stock of where the program that Scripps-Howard columnist Harry Van Horn calls "the best education show of 1953" is heading.

During the year, it has taken you on explorations into wild and little-known parts of the world, re-enacted the birth of the earth, and shown the development of life on it. Subjects as high and wide as the solar system, the complex composition of a hen's eggs, what animals can see, the cultural crisis in the Navajo Indian, and the cause of thunderstorms have been on "Adventure."

Some people, commenting on the "banquet" that has been dished up, ask how long the material can last. This is usually television's worst worry. But I don't think that the question bothers anyone who really knows the extent of the American Museum's collections and research archives. Its anthropological collections number well over 2,000,000 specimens, the mammal display over 150,000. The Museum's 58 Halls and 2302 exhibits, together with workshops, laboratories, and studios, cover 25 acres of floor space, which will not easily be exhausted.

They represent a billion years of time and almost the entire surface of the earth. Expeditions are continually adding to the store. Besides, the Columbia Broadcasting System can draw upon the informational resources of The Hayden Planetarium—the Museum's astronomy center and "Theatre of the Stars."

If there is anything unusual about the cast of this show, it is that in a year of presentation there has not been a single star—except the Museum. Thirty-five scientists from the staff of the American Museum have appeared on the program during its first year, as well as many other specialists. On one program, for instance, it will be recalled that Associate Justice of the Supreme Court William O. Douglas and Maurice Herzog of Annapurna fame appeared. Charles Collingwood serves regularly as guide, but it is the Museum that has been the only hero of the piece. Some may have doubted that a Museum could be "brought to life" for the video screen, but perhaps it is not going too far to say that it has sometimes rocketed about more like a blustering youngster. At other times, it has come to represent, through the personalities of its scientists and others, a versatile, tolerant, and extremely well-informed character actor.

The present writer cannot claim the smallest share of credit for the birth or growth of the "Adventure" program, and his opinion would be only that of another television viewer, with a tendency toward favorable bias. But the television reviewers, whose business it is to see all and compare, should have been able by now to give opinions that have meaning. The well-known critic John Crosby, has called the "Adventure" program "a lively show in which learning is not only painless but wonderfully exciting." *Television Guide* said: "With only the sky as its limit, the staff of 'Adventure' isn't timid about taking off in almost any direction on its mission of simplifying scientific concepts for

America's tele-viewing millions."

Its producer, Perry Wolff, is twice a winner of the Peabody Award.

For those who may not know the magnitude of an undertaking of this sort, the Columbia Broadcasting System has spent \$650,000 to find out whether the public wants this kind of television. As a sample, the "Adventure" program that portrayed the Lewis and Clark Expedition cost them several times as much as the Congressional appropriation for the Expedition itself, which lasted two years and four months.

A few weeks ago, John Crosby referred in his column to the interesting things that are being done on the "Adventure" program to make education as absorbing as Milton Berle, as he put it. "I think I am safe in saying," he wrote, "that 'Adventure' as of this writing is the most experimental television program anywhere around, and I hope it stays around. I throw that in only because 'Adventure' has gone without a sponsor for almost a year now . . . I don't know why a sponsor in search of a prestige program—and there are a few—doesn't pick up the tab here. It's a wonderful show."

We are all for the comedy stars, the commentators, and the cooking tips, but as Terrence O'Flaherty put it, ". . . someone would be getting a good deal; 11,000,000 specimens for the price of one comedian."

Nobody told me to say this or even asked me to. But I feel close enough to the readers of NATURAL HISTORY Magazine to ask for a moment's thought, on this anniversary, concerning the cycle of activities that comes to focus on your screen under this one word "Adventure." We have said very little about it all through the year. If the American public wants it, we'll keep on getting it.

From looking at next year's prospectus, I would say that it appears even better than last year's series. The schedule is not laid out firmly enough for me to sketch it in detail. Briefly, the producers hope to continue along the same general lines, but with the benefit of the first year's audience-reactions to build on. By the same token, the schedule is fluid enough to be influenced by what those who care enough will trouble to write in and suggest.

EDWARD WEYER, Editor

"then the dragon came..."

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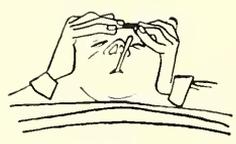
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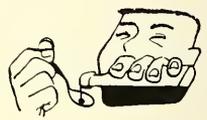
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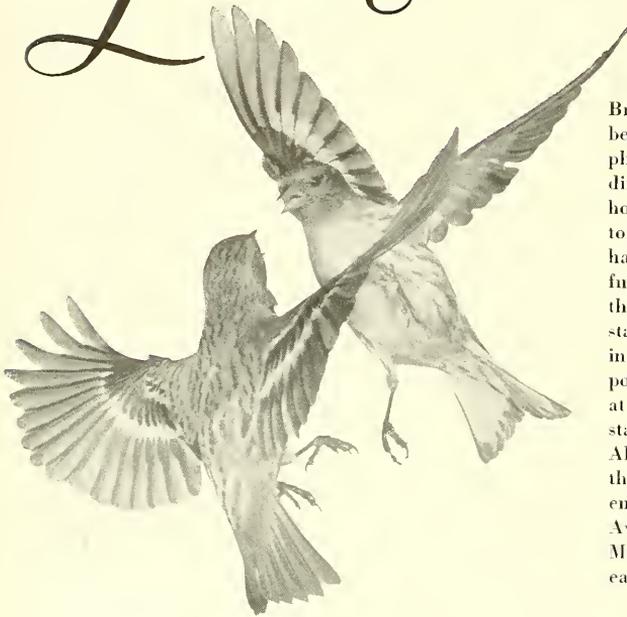
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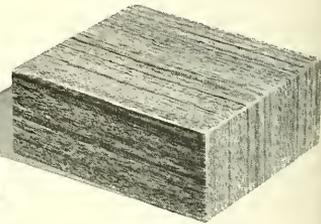
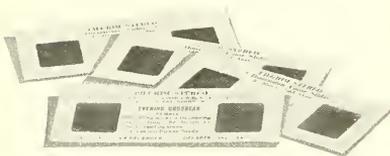
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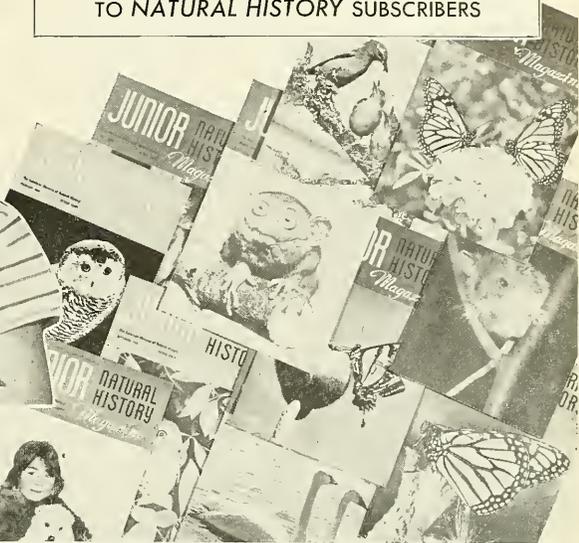
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▲ BEAR TRIPLETS: a study in ursine facial expression, by Harry T. Becker

LETTERS

Three Little Bears

SIRS:

An Alaskan trapper came upon these three cubs and the mother bear raiding his food cache. The mother bear, upon seeing the trapper, chased the cubs up a spruce tree near by. She then made an attempt to charge the trapper, and in self-protection he was unfortunately required to shoot the bear. As the cubs were quite small, he decided to climb the tree and capture them alive. In the process he was bitten a number of times by their small needle-sharp teeth before he was able to get them into a gunny sack. Shortly after they were captured, I took this photograph with a 4 x 5 Series D Graflex.

HARRY T. BECKER

Coupeville,
Washington

Philosophy in a Fire Tower

SIRS:

I read with interest Stephen Tonsor's "The Fire Lookout" in the June issue of *NATURAL HISTORY* because I had been a lookout in a house that was the exact double of the one pictured on Red Mountain in the Boise Forest. Unlike Tonsor however, I spent my term in absolute solitude, alone on a crag, utterly out of touch with civilization except for a two-way radio. As Mr. Tonsor says, one develops entirely new sets of values in such a situation, and the most insignificant things take on new meaning—the call of a coyote far below on a crag, an eagle's soaring flight, the eerie feeling of being above the clouds...

WOLFF GROSS

Harvard College
Cambridge, Mass.

Salt Water Cowboys

Since the world's expanding population has put a new burden on food resources, biologist Frank J. Mather III has made it his specialty to chart the location and movements of the large bluefin tuna in the Atlantic, one of the most valuable food fishes. Information on the tuna has been scanty owing to the lack of a method of tagging the fish. Birds have been banded for many years, the branding of cattle is as old as the hills, and methods have recently been perfected for tagging small fishes, such as cod and haddock. But the powerful tuna has defied the man with the number. So Mr. Mather went to sea last May, not with a lasso but with small harpoons, branding irons, large needles and plastic loops. Mr. Mather is determined to know the tuna the way we know the Hereford and Holstein. As the Institution at Woods

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NATURAL HISTORY

The Magazine of the American Museum of Natural History

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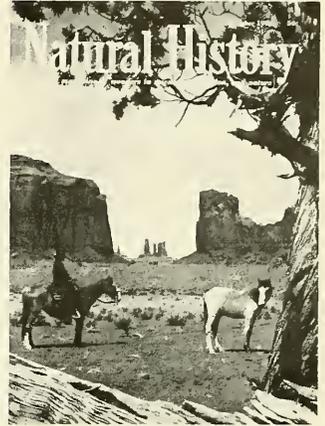
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September, 1954
Volume LXIII, No. 7

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You will find NATURAL HISTORY Magazine indexed in Reader's Guide to Periodical Literature in your library



THE COVER THIS MONTH

This Navajo woman's wool blanket, velveteen blouse, bright skirt, and horse all reflect her adoption to white man's ways, yet they form the distinctive ensemble of a typical modern Navajo. The background—a scene in Monument Valley near the eastern end of the Utah-Arizona border—shows the harshness and grandeur of her homeland.

When the Spanish first found the Navajos, they probably numbered under 2000. Today there are over 60,000 of them, but the increase does not reflect prosperity. By 1930, overgrazing by sheep had seriously weakened their land, and the failure of our government to provide schools and other facilities left them quite handicapped. In recent years, both the Indians and the government have developed a more conscientious approach to the problem. However, it may take some time to achieve satisfactory health conditions and economic stability without damaging the cultural traditions the Navajos cherish.

Fine Navajo exhibits are on display at the American Museum of Natural History, and no traveler should pass through Santa Fe without visiting the Museum of Navajo Ceremonial Art.

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BACK OF HISTORY

by William Howells
 Doubleday and Co., \$5.00
 384 pp., 58 illus.

WITHOUT any question this is one of the best popular presentations ever written on the historical approach to anthropology. All branches of anthropological science—physical anthropology, archaeology, ethnology, and linguistics—have been woven together skillfully to tell the exciting story of the evolution of man and his culture from earliest times to the dawn of recorded history.

In order merely to hit the high-spots of so vast a subject, the author has had to digest a truly prodigious amount of material. The extraordinary thing is that so scholarly a book could have been written in so conversational (though never condescending) a tone. Dr. Howells' easy style brings such wit and humor to his narrative that the reader is scarcely aware of the hard work and broad knowledge that underlies it.

In the hands of a less skillful writer, fossil apes and stone implements can be incredibly dull, but *Back of History* has all the human appeal of a good historical novel. And anyone who can make linguistics not only intelligible, but amusing as well, is by way of being a genius. Dr. Howells even accomplishes this most difficult feat.

The central theme of the book traces the development of society and culture in relation to the needs of man the animal. It gives the reader a clear insight into the nature and function of human institutions, and an understanding of historical process that can never be gained from the study of history in the narrow sense.

It seems to me that the main shortcomings of the book are the fault of the publisher rather than the author. The line drawings and maps are too few and rather poor. They will not, however, prevent the reader from enjoying this most informative and entertaining book.

HARRY TSCHOPIK, JR.

OUR AFRICAN ADVENTURE

by William African and Irene Morden
 Seeley Service & Co., Ltd., London, 18/256 pp., 40 plates, and 2 maps

OUR African Adventure is an account of the trip taken by Colonel and Mrs. Morden from Cape Town to the

Egyptian border on the Nile River. The prime objective of the trip was to collect entomological material from little-known native tribes for the American Museum of Natural History. This necessitated numerous side trips into parts of Africa less frequently visited by safaris. Big game hunting was a minor part of the expedition, although Mrs. Morden secured her first lion and elephant. A series of motion pictures of natives and other animals was also brought back.

Any person contemplating taking the Cape-to-Cairo trip will do well to read this book. It gives a wealth of information and is delightfully told. The book was of special interest to this reviewer as most of the story followed the route taken by him a few years before, and many pleasant memories were brought to mind. But whether you have been in Africa, are contemplating going there, or just enjoy reading about that continent, you will find enjoyment and interest in perusing the pages of this very readable book.

T. DONALD CARTER

ANIMALS, MEN, AND MYTHS

by Richard Lewinsoln
 Harper and Bros., \$5.00
 422 pp., 31 pp. half tones; 80 figs.

THIS is a very entertaining account of the very important part animals have played in the development of man's culture and of his philosophy. Man, after all, is pretty much a creature of his environment, both as an individual and as a serial member of an evolutionary pattern, and animals are one of the dominant factors of most environments. To a rather significant extent, therefore, man's history has been slanted, for better or for worse, by his animal neighbors.

Lewinsoln has developed his thesis in a very scholarly manner, shows a good grasp of the subject, and cites an impressive bibliography as source material for his book. The subject is treated under six parts. Prehistory, Antiquity and the Middle Ages, the Age of Discovery, the Age of Ideas, the Machine-Age, and the Age of Chemistry. Twenty-nine chapters, eighty figures and forty half-tone plates give the reader an abundance of data, of examples, and bits of tradition and folklore to show how much human lives have been interwoven with those of animals.

There is a great deal of sound instruc-

tion in this text and unexpected additions to one's knowledge. The appeal of sheer readability makes it difficult to lay the book aside. There are many thought-provoking passages.

"Man is subjecting the animal kingdom to his will in ever increasing measure. First he imposed his will on the large animals. Some he exterminated... In Darwinian language man's struggle for existence has entailed... selection not only among his own species but among many others as well."

"Everything that man has done leads to the conclusion that in the future the continued existence or the extermination of animals is going to depend even more on the human will than it has done in the past."

This is a translation of a German original, and it is a splendid example of fluent English.

HAROLD E. ANTHONY

AMERICAN SEASHELLS

-----by R. Tucker Abbott

D. Van Nostrand, \$12.50
341 pp.; 40 plates, 100 figs.

TO collectors of marine shells this long-awaited book meets all expectations. A collector on the Florida keys, along a Texas beach, a New England bay, or on a bold headland of the Oregon coast will find the names of nearly all the shells that he collects. This book will have a strong appeal to the lay reader and collector and to the advanced student as well as the professional worker.

Abbott has added far more than the descriptions and figures of the shells that are to be found in the seas on both coasts of North America. There is much on their biology, methods of collecting, preparation and procedures for storage and study. An exceedingly valuable chapter is on the literature in the field of Mollusks, listed in many categories for easy reference. The photographic work by Frederick Bayer is most excellent, as exemplified in the many halftone and colored plates. Many of the pen drawings are reproductions of the originals, which were done by John C. McConnell many years ago, mainly for W. H. Dall. He was a master of his art and his work has seldom been equalled. Many of these drawings are from the type specimens, most of which are contained in the collections of the United States National Museum.

D. Van Nostrand Company is to be complimented on their selection of quarto size for this book, for the paper and type, and the attractive format.

Abbott has had varied field experience in many portions of the world and writes about our North American shells with the background of having seen these

animals and others like them in their own environment. An Associate Curator of Mollusks in the United States National Museum, he has at his disposal the largest collection of Mollusks in the world.

WILLIAM J. CLENCH

JOURNEY TO THE FAR AMAZON; AN EXPEDITION INTO UNKNOWN TERRITORY

-----by Alain Gheerbrant

translated by Edward Fitzgerald
Simon & Schuster, \$5.00
353 pp., 33 photos, 5 maps

BECAUSE of political unrest or native uprisings, most of the world has become unsafe for explorers. For this reason, the literary market has recently been flooded by books dealing with perilous trips to the "unknown" Amazon. But unlike its recent predecessors, this book is not a tall tale by a professional "explorer" writing with an eye to the best-seller list. M. Gheerbrant and party do not see snakes on every page, find lost cities, nor are they even attacked by hostile Indians (although they might well have been).

This narrative of a journey by three young Frenchmen and their Colombian companion, from Bogotá to Manaus via

the rugged, unknown Parima mountains between Venezuela and Brazil, represents something of a landmark in recent exploration in South America. First, much of the territory really was unexplored, or, at least, hitherto unrecorded, and some of the Indians encountered, such as the Guaharibos and Maquiritares, actually are almost unknown to science. Most importantly, the book is honest, sincere, and straightforward, and the dangers and hardships (of which there were many) are minimized rather than exaggerated.

Throughout all of their tribulations, the young adventurers maintain a rare good humor, and everything that they see in this new forest world captivates their imaginations. The author has managed, furthermore, to convey the impact of his experiences to the reader in a highly literate narrative style.

At times some observations of native customs are naive or misinterpreted, but one at least feels confident that the factual reporting is accurate. These minor technical errors, however, will be of no concern to the nonspecialist and in no way detract from what is unquestionably a valuable contribution to Amazonian exploration. The book is enhanced by excellent maps, provided where they are most needed, and by adequate and interesting photographs.

HARRY TSCHOPIK, JR.

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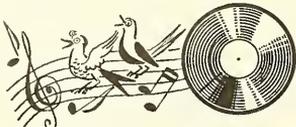
Recent issues have featured the discovery and exploration of hidden Mayan temples, the deciphering of clay tablets inscribed by the Greeks 3400 years ago, reports by field archaeologists on their work in North and South America, Egypt, Baluchistan, Algeria and nu-

merous other 'sites around the globe.

All articles are written by scientists, experts in their respective fields. Their material is presented in non-technical language with a wealth of illustration.

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AN INTRODUCTION TO TREES

-----by John Kieran

Hanover House, \$2.95
77 pp., 100 illus.

THIS is the third in an introductory series to fauna and flora and presents such readable text and beautiful illustrations that readers who need no introduction may, nevertheless, enjoy renewing old acquaintances and may even discover items heretofore overlooked.

The author states: "This is a book for beginners and has been made as simple as possible." This does not mean that it is a child's book, although a child can soon learn to use it for identifications and can follow the text easily for the most part. The reader is introduced to a different plant on each page, he is given the most readily apparent and the most useful characteristics of the species, including the common name in current usage as well as the Linnaean name, and then he is told interesting facts associated with that particular tree. For example, the Bald Cypress has "knees" rising out of the water, some say to permit air to reach the roots, others maintain they are anchors. Kieran does not state what he believes, so the reader can decide to suit himself! It is of interest to note that the "spreading chestnut tree" of Longfellow was a horse chestnut, although this is appropriate for a blacksmith when one stops to think.

The selection of trees is comprehensive enough to range from the Redwood down to shrub-sized plants and the poison ivy is included because it is important to learn early how to recognize it.

The illustrations are excellent. They are in color, the values are good, registration excellent, and the detail is usually adequate. Most of the illustrations give details of leaves, flowers, and fruit; occasionally the full tree is shown. There is a tendency to stylize the full tree figures; they do not show the fidelity to character noted on tree parts.

HAROLD E. ANTHONY

INSECT FACT AND FOLKLORE

-----by Lucy W. Clausen

Macmillan Co., \$3.50
194 pp., 30 figs.

THIS is indeed a charming and informative book on those aspects of insects that are little understood and appreciated by the general reader. I am sure its readers will find it most delightful and refreshing to be introduced to an author whose "concern has always been to present insects in a favorable light." Dr. Lucy Clausen has had a won-

derful opportunity to develop interest in insects through her long and direct contacts with the hordes of visitors from all over the world that crowd the American Museum of Natural History in the great city of New York.

In her delightful style she has included the most interesting and essential information to satisfy and enthuse the eager persons seeking a well-rounded knowledge of these most numerous and remarkable of all animals.

Since earliest times certain insects have been used for medicinal purposes by both savage and civilized man. They were also extensively collected for food. Locusts, which often devastated great areas of the world, were eaten in lieu of the crops they consumed. Even today, the tourists in Mexico eagerly seek and devour the palatable "gusanos" which are caterpillars that feed on the maguey or agave!

The story of the native and wild silkworms is enough to stir the interest of any lover of nature who must now face the fact that synthetic fabrics may soon replace this marvelous old fabric that through the centuries was worth its weight in gold!

The honeybee is also most charmingly presented. It is probably the oldest domesticated animal, and in early days honey was the only important "sweet" available in reliable quantities until sugar was made available in the reign of Queen Elizabeth in England. The value of bees as pollinators and the use of honey medicinally and for candlemaking and a host of other purposes are included by the author.

The book is replete with all sorts of surprising, most unusual, and intensely interesting facts that every layman can enjoy, and even the experienced entomologist will be loath to lay it aside until it has been read from cover to cover!

I recommend it enthusiastically.

E. O. ESSIE

THE HANDBOOK OF AUTO CAMPING AND MOTORIST'S GUIDE TO PUBLIC CAMPGROUNDS

-----by George and Iris Wells

Harper and Bros., \$3.00
243 pp.

THE rapid spread in popularity of combining the great mobility of the automobile with the easy outdoor back-to-nature life of camping has produced a need for a book like this. Camping is inexpensive because all you pay for is your initial equipment, food, and the cost of running your automobile. You have the feeling of greater remoteness from city life than you find in most hotels

continued on page 336

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Background of the

Mau Mau



KENYA, to me, was different from any other part of Africa I had seen during my seven months' trek north. This I knew the moment I saw its limitless plateau, the giant rift in its earth, its 17,000-foot mountainous landscape.

I imagined that the streams and rivers rolling from the great mountain had produced fertile land and had greatly influenced the tribes who had settled in its folds, that the volcanic rift must have curbed the land expansion of others, that the vast plateau must have been an incentive to nomadic tribes to spread their herds far and wide.

What I had not imagined was that I would soon be in the most deeply stirred native sector of Africa. The revolt had started many years ago, but only now had it spread, and the Kikuyu tribe was on an orgy of arson and murder!

How it had come about, I was to find out much later. The land was partly responsible, but men had done the rest. Both blacks and whites had had a hand in it.

"I have lived in Kenya 30 years," said the man sitting opposite me, as he looked out the train window. "I have crossed the Rift countless

◀ **A KIKUYU** in Kenya Territory, British East Africa. There are 1,200,000 members of this tribe, but no one can determine how many of them belong to the Mau Mau or which ones

Insight into the history of the Kikuyu tribe sheds light

on the terrorism that is the curse of East Africa today

By Diane leC. Rawson

All photographs by the author

times, yet the sight of it has never ceased to thrill me. The other side means home to me. But now it has changed. There is fear, and those dreadful long nights of waiting and listening!

He must have noticed my astonishment, because he quickly added:

"Are you new here? Could it be that you haven't heard of the Kikuyu? They are a bad lot. They are ruining a beautiful country. They were always undependable! I have had many working for me. Sometimes they would leave without reasons; they would not even bother picking up their wages. There is an old saying around here: one rarely knows the mind of an African but never that of a Kikuyu!"

True, outside of Kenya and among other tribes of Africa, I had seldom heard the Kikuyu mentioned. Here it was different. Their name was on everyone's lips, and for many reasons. It was not only because Kenya was their home, but of the 80 or more tribes of the Colony, the Kikuyu was the largest—1,200,000 strong. They constituted one-fifth of the whole tribal population of Kenya. Also, for the past 40 years at least, they had formed

➤ **TWO ELDERS** of the Masai tribe, whom the Kikuyu fear as cattle raiders. When the British engaged the Masai to help subjugate the Kikuyu, ill feeling increased. These men are refusing to let the author visit their village in Tanganyika



the bulk of the labor force of the European settlers. These two factors could not be ignored; but what my companion had said did not refer to this. He was speaking of murder and arson, which now were common. The tribe was on the rampage, and blood was flowing freely. Fear was spreading both among the tribe and the white settlers.

I soon found that the unrest was not new. Twenty-five years earlier a sect known as the Watu wa Mungu had emerged from a mass of conflicting religious beliefs and mysticism. An ex-mission boy announced he had found a new god, and he added: "We will no longer have to use the white man's god!" Members of the sect reverted to primitive weapons and asserted that they were ready to resist outside interference. But the sect had little cohesion, and it died out. Other sects succeeded, and there was more bloodshed, but they also came to an early end.

Almost simultaneously with Watu

wa Mungu, an organization with political aims had come into existence, but instead of dying out, this one survived. It was known as the KCA, or Kikuyu Central Association, and it had grown with the years. The reason for this was simple. The Association had strong leadership. Jomo Kenyatta, their leader, had not forgotten two important characteristics of his people—their lack of cohesion and discipline and their depth of mysticism and witchcraft. He knew that they could be rallied and inflamed only through the marshaling of religious discontent; he also knew that to a Kikuyu nothing is more sacred than the taking of an oath according to the tribal rituals. He made use of what he knew, and this included a knowledge of the white man, which he had acquired during his many years of life in both Russia and England.

When I arrived in Kenya, the KCA had slipped into the background, and it was of the Mau Mau

movement that one heard everyday. But only a scratch on the surface of the Mau Mau organization revealed that it was the brain child of Kenyatta and the old KCA. Kenyatta was now exploiting the people's fear and discontent to the fullest for his own political end. The people were corralled by circumcision groups, and fear was put in their hearts through a gruesome oath-taking ceremony. The discontent was easy to find; the land question, closely related to their religious beliefs, which had been tampered with by the white men, could be waved like a red flag.

And so the tribe was now on the rampage, and men—black and white—died daily.

Little is known of the people of Kikuyu—except, possibly, that they settled some 700 or 800 years ago in the vicinity of Fort Hall, about 50 miles northeast of Nairobi, the present capital of Kenya. They were a prolific tribe and soon found that they no longer had sufficient land for their people, so they expanded. To the north they moved into a region known today as Nyeri, at the foothills of Mount Kenya, and to the south into a region then occupied by the Wandorobo tribe, known today as the Kiambu district. The soil they found was fertile from the streams flowing from the snowfields and glaciers of Mount Kenya. But much of the land was forested, so the men went to work. They felled the trees and



▲ MEMBERS of the proud and independent Masai tribe: a warrior, a young girl, and an elder

The map at right shows the location of the British colony of Kenya, in which the Kikuyu live



broke the ground, and the women came and tilled the soil. As years passed, their region became one vast garden and was known as a granary to the passing caravans. The men had few skills, but they became sharp traders, and to this day they have retained this reputation.

But as people are affected by the country surrounding them, they are also affected by its inhabitants. The Kikuyu were no exception to this. The prosperity of their land, although a blessing, also became a curse. They became the envy of other tribes, and from early days they learned to be constantly on the alert to defend themselves. With the aid of tortuous trails and poisoned arrows, they made their region more and more impregnable, and their means of defense became more treacherous. The war pit was the most dreaded. Concealed and spiked with sharpened bamboo sticks, it spelled a fearful death to any man falling into it.

Of all their neighbors, the Masai were the most feared. They were not a conquering race but possibly the greatest cattle raiders of Africa. To any African herder, the cattle raider is a major menace, for cattle are a man's wealth and they give him what standing he has in the tribe. But to the Masai, cattle meant even more. The Kikuyu knew of the Masai belief that their Masai god Engai (the sky) had given them all the cattle in the world. They knew that the Masai were willing to face death in order to take cattle from other tribes. And so the Kikuyu lived in constant fear of these raids.

The courage of the tall Masai is proverbial. Until recently, they fought lions with spears, for they considered either firearms or bows and arrows cowardly. A District Commissioner said to me: "They claim that no lion would ever attack a man who stood motionless, even if only a few feet away!" Then he quickly added, "Of course, none of us can disprove this, for *we* would never have the courage to test it."

From the start, the Kikuyu, smaller in stature, unaccustomed to fighting in the open, and lacking both obedience and discipline, was no match for the tall, militarily disciplined Masai. Soon their only chance of retaining their cattle lay in their use of trickery and cunning. As years passed, the tribe acquired

an unenviable reputation of treacherous fighting. And so it was, for it had become essential to the survival of the tribe.

It seems evident that the Kikuyu were strongly affected by the proximity of the Masai from early days. Not only was their character partly molded by fear of the Masai but



▲ AN OLD KIKUYU. Many members of the tribe oppose the Mau Mau terrorism. Yet the cruelest sort of atrocities continue to be perpetrated by those who have taken the horrible vows. Ownership of land is a burning question



▲ A YOUNG MASAI. Until recently, these courageous neighbors of the Kikuyus fought lions with spears, for they considered firearms or bows and arrows cowardly

also by envy of their prowess. In war costumes, they seem to have copied the Masai shields, headdress, and war paint.

The next event of importance to affect the tribe adversely occurred at the end of the last century. It was then that the Kikuyu were suddenly ravaged by a succession of four calamities. Rinderpest attacked their cattle; drought and locusts destroyed their crops; and smallpox killed many of their tribe. Much land was abandoned, and the people retreated toward the interior. Then, shortly afterward, came more men, new men, to further disturb their tribal organization. This time it was the white man.

From what I had heard and experienced since my arrival in the Colony, it was obvious to me that there was no great love on the part of the Kikuyu for the white man, and often the feeling seemed reciprocal. I wondered if this animosity were new, possibly tied up with recent unrest, or if it had started long ago. As often is the case, it had started long ago and had become worse with the years. The most important issue today was the land issue.

From the early days of their expansion, the Kikuyu had distinguished themselves from other tribes by their method of acquiring land from others. They did not do it by conquest, nor did they do it through forced purchases. Because of ancient religious beliefs, the land of other tribes could be acquired only through mutual consent of the vendor and the buyer. The Kikuyu said that if this belief were broken, the spirits of the original owners would torment them and prevent them from enjoying the land.

The white man might have followed the custom of the tribe had he come before the great disaster caused by smallpox, rinderpest, locust, and drought. He might have done so had he come long after the time when the tribe had occupied more land. But this was not the case. When the white man arrived in Kenya, the land that had once been occupied by the tribe, and

abandoned after the great calamity, had reverted to jungle, and no one could tell that the soil had ever been cultivated. The region was taken over. At the time, there were no complaints, but looking back, it becomes a tragic blunder. That it was not intentional does not minimize its impact on the tribe. The people only remember that the land was theirs and consequently still is theirs.

Soon afterward came blunder number two, when the British engaged the help of the Masai in their subjugation of hostile Kikuyu. From that time on, the white man, in all relations with the tribe, had two strikes against him. Later, some missions attempted to stamp out female circumcision, and this caused deep resentment among the people. We had disturbed one of the fundamental traditions and religious beliefs of the tribe.

As I went into the villages, I could feel that my presence was resented and my intentions suspected. Among other tribes I had encountered curiosity, amusement, sometimes genuine friendliness. The Bantu people, more jovial than the Nilotic tribes, would often find me an excuse for a feast or a dance. The Watusi had shown dignity and courtesy. Among the Masai, it had been a still different experience: their disciplined independence and disarming sense of humor were always part of them. They never allowed a European to forget they were Masai, and no one orders a Masai around. As they often repeated, "There are only three types of people in the world—the Masai, the Europeans, the natives!" The white man had known this from the start and had respected it. Perhaps we should also have known it about the Kikuyu; but unlike the Masai, the Kikuyu formed the bulk of the labor force working for the white man. We had seldom seen him in his own environment and had almost forgotten that he, too, had ancient customs and deep religious convictions.

I thought of my train companion: "They were always undependable

... had many working for me... they would leave without reasons..." Since that time, I often heard the same complaint. I wondered. I would ask Kathleen about it. She ran a large farm and had always employed only Kikuyu.

Bukerton Farm was located at the foot of the Aberdare Range and was now in the worst sector of Mau Mau terrorism. It had worried me to think of her, alone, a white woman among her Kikuyu workers: yet her last letter had said that everything among her people was peaceful. When I reached Bukerton, the country around was quiet and enchantingly beautiful—as only Africa can look when the sun sinks in the horizon. When Kathleen met me at the door, though, I instantly knew that something serious had happened.

"The boy will take you to your room," she said. "I believe you will find everything you need. Dinner is in an hour. Do forgive me now, but I must call the police right back. They arrested one of my boys!"

I did not see Kathleen again until the gong was sounded. At the table I was the one who spoke first. "I am sorry it happened," I said awkwardly. "Of course you had no way of knowing he had taken the Mau Mau oath!"

"That isn't it at all," she quickly retorted. "He is *thahu*, and I had promised him he could go to his village and be purified. Now he is frantic."

It was obvious that I should have known the meaning of *thahu*, but I did not. I confessed my ignorance.

The word *thahu*, I found, had similarity of meaning with the better known word "tabu," suggesting that what is *thahu* has been segregated, forbidden, cursed. Among the Kikuyu the number of things that can make a man *thahu* is endless. The concept is one of the tribe's most ancient beliefs. If, for instance, a dog dies in a village, the head of the village and his people are *thahu*; if a man steps over a corpse, he is *thahu*; if a woman carrying a gourd on her back drops it and it breaks, she is *thahu*; and



▲ A MASAI WOMAN photographed near Mount Meru, Tanganyika

so on, in almost every activity of life. The point of importance, though, is that no Kikuyu will ever rest until he has freed himself of the curse, and this he can do only by purification by the witch doctor.

"I believe," said Kathleen, "that this is largely responsible for the common accusation that the Kikuyu are undependable. If a boy asks to go to his village, it is likely for the performance of some tribal ritual. More often, it is because he is *thahu* and has to be purified. If the boy is asked too many questions, he will invent excuses; if the employer is ignorant of the customs, he may forbid the boy to go. That is when he will leave and often not even claim his wages. Then he will

not dare to face coming back."

Again I thought of the man on the train. Apparently it had often been his experience.

"I remember a friend of my father's," she continued, "who was in the Colonial Service in this region in 1910. He warned us against this. He said that the reality of *thahu* in Kikuyu life and thought would probably be underestimated by us and would bring disaster. I asked why, and he said, 'you will unfairly judge the Kikuyu people and accuse them of things they never did. This, no tribesman could ever forget.'"

"But why was your boy arrested?"

"The police were here yesterday. They were following the track of a Mau Mau terrorist, and they said it ran through my land. They did not want to lose the track, so they ordered the boys to remain indoors. I fear I am partly responsible for what happened next. I told the boys to stay inside but totally forgot my promise to one of them to let him return to his village. Today he remembered my promise—he knows I never broke one—and left for his village. As he walked across the field he was arrested. I went to see him immediately. It was pitiful. I reassured him that as soon as he was released, he could go to his village, but he was still apprehensive. He looked like a trapped animal!"

"Now, with the Mau Mau trouble, what do you really think of the Kikuyu?" I asked.

For a moment she paused; then she ran upstairs. When she returned, she had an old letter in her hand. "Read it," she said. "It was written 40 years ago, but it speaks of the same people."

As I read on, one sentence stood out: "...exceptionally good native material," the young District Commissioner had written, "but of so plastic a character that if badly treated at the beginning, it is spoiled permanently!"

I thought of the many hands that had molded the Kikuyu, and I wondered.



HOUSEWIVES *help* *Hit a Pest*

By ISABELLA V. LELAND

Photographs Courtesy Garrett-Idaho Statesman and the U. S. Forest Service

When 130,000 acres of valuable timber were invaded by the pine butterfly, the community went all out to halt the damage.

WHO could have guessed that Idaho City, the all but abandoned gold-rush town, could become the scene of such unusual activity? It is the spring of 1953, and just beyond Main Street, where prospectors lucky enough to "raise the color" of gold once caroused, stands the Idaho City Forest Ranger Station and Experiment Station. Trucks pull up each afternoon, loaded with bulging, brown burlap sacks. They are full of twigs from pine trees. Men tote them into the garage where four girls sit at a table working.

The men are workers from various Idaho lumber companies. The girls are housewives who live on the Station. They are engaged in a project that means more to the wealth of Idaho than all the old prospectors' gold—protection of great tracts of fine timber from the pine butterfly. Their project forms a striking example of prompt and

generous co-operation between members of the lumber industry, experts of the U. S. Forest Service and the Bureau of Entomology and Plant Quarantine.

Fluttering along in the dappled sunshine of summer, the pine butterfly (*Neophasia menapia* Felder and Felder) looks like just another pretty white butterfly, but when she lays her eggs, she glues them in a row along the needles of a pine, preferably a ponderosa. The next June the caterpillars hatch out and begin devouring one pine needle after another, both the old ones and the tender new ones.

The tree can stand one or two years of this, but the growth ring for those years, when seen in the cross section, will be thin. And if the tree survives the second year, it will be so weakened that it will become an easy prey for another enemy, the western pine beetle, and will soon die.

The Forest Service spotted some signs of trouble last year in the Boise National Forest, south-east of Lowman, between the south fork of the Payette River and the middle fork of the Boise River. Investigation showed that a real outbreak of pine butterfly was beginning. Experimental, small-scale spraying produced good results. Plans were laid for a large attack in 1954.

The first step was a broad air survey in August of 1953, while the adult butterflies were in flight. So many were seen that 130,000 acres of pine timber were believed to be heavily infested, with a total acreage of 169,000 to be considered. And alongside lay more large acreages representing a billion board feet of fine lumber. Major action was called for.

On September 9, in Boise, Boise Forest Supervisor K. D. Flock and Regional Entomologist Leslie W. Orr from Ogden met with repre-

sentatives of the Idaho State Government, citizens' committees, and lumber companies.

Entomologist Orr outlined the problem. To treat 169,000 acres of trees, 169,000 gallons of DDT in oil must be used. It must be brought in tank cars to a waiting plane, as near as possible to the locations of heaviest infestation. The first step, then, would be to pinpoint these locations.

The aerial survey had shown a heavy population of pine butterfly, but from the air only the males are visible, because they fly above the trees. The males also range farther

than the females, so their location does not tell just where the eggs are being laid and where the larvae will be doing their damage. To gain this all-important information, someone would have to bring in twigs from dozens of charted spots throughout the area for examination.

Neither the Forest Service nor the Bureau of Entomology had enough men or money available to pay for extra help.

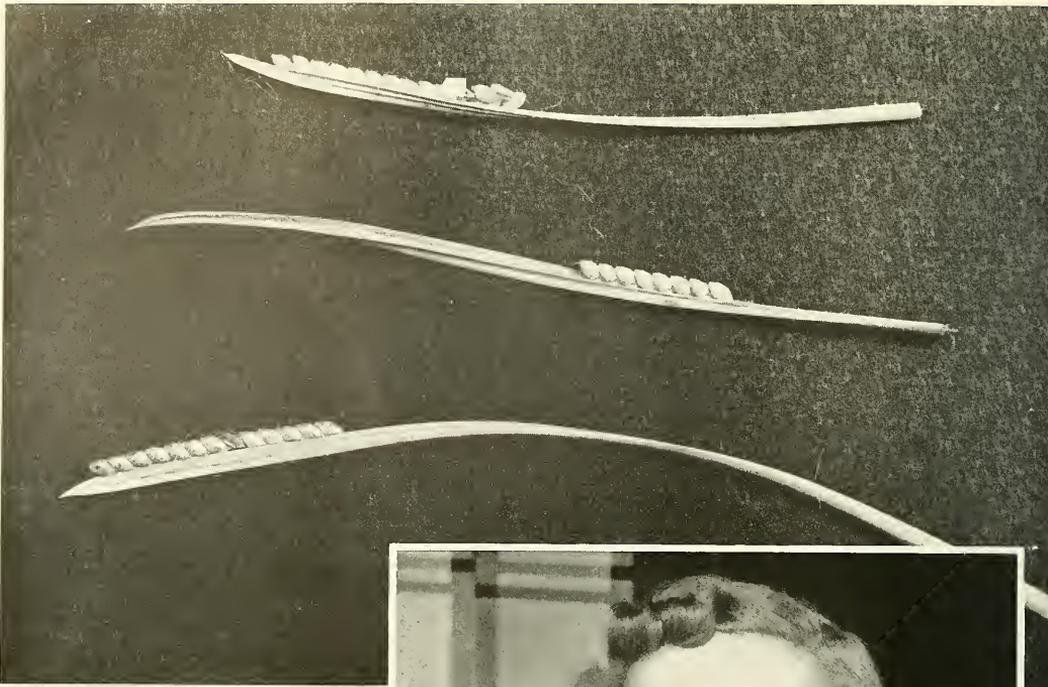
The lumber industry's response was instantaneous. From their company staff, they detailed ten men to undertake the task. These men—

▼ To PINPOINT THE ATTACK, sample twigs from far and wide over the area had to be examined for butterfly eggs



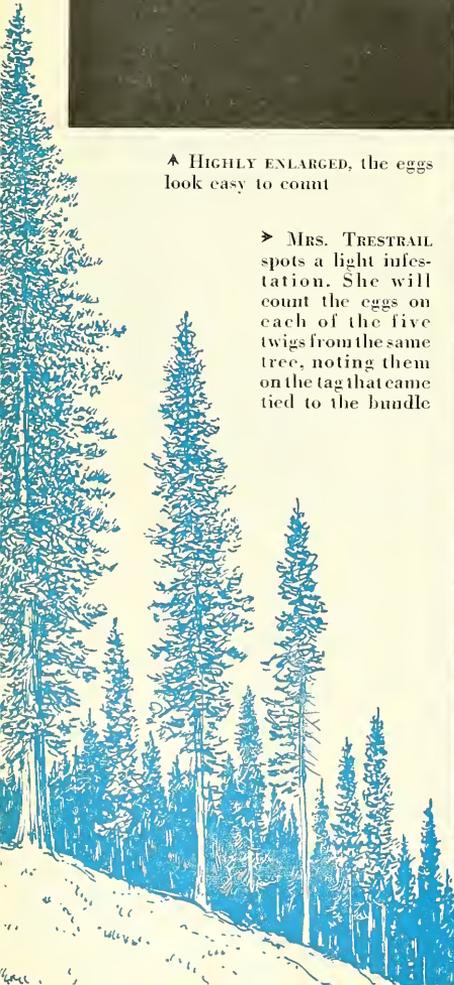
▲ A PENCIL POINT made a good counter. As many as 299 eggs were found on one twig. The girls were able to process 20 sacks of samples a day





▲ HIGHLY ENLARGED, the eggs look easy to count

➤ MRS. TRESTRAIL spots a light infestation. She will count the eggs on each of the five twigs from the same tree, noting them on the tag that came tied to the bundle



sawyers, skidders, anyone who could be spared—were delegated to work out of the Idaho City Ranger Station. None had ever tackled such a job before. Mr. Orr gave them a careful demonstration. Five twigs had to be picked from each tree, one from each side, high and low. The five twigs would then be tied together with twine to which was attached a tag showing the number given to this spot on the map. Twenty trees in the same spot would thus be sampled, and the twenty little bundles of twigs would be put in one burlap sack and brought back to the Station.

Next came the problem of the egg count. Each tiny bead on each needle had to be counted. Neither the Ranger Station nor the Experiment Station had staff enough for the task. Mr. Orr enlisted the wife of Ranger Jack Miller, of Assistant Ranger Richard Trestrail, of Silviculturist Al Wilson, and of Dispatcher Cecil Palmer.

In one morning, he taught them the technique — how to take one twig at a time, fan out the needles and look first at one side and then the other, to break off any needles showing eggs, count the eggs, and record the totals on the tag. The twigs must then be burned, and the 20 tags from the one sack tied together, the figures on them to be translated by the entomologists into percentage of infestation for each spot on the map of the entire area.

The girls took to their strange task happily. They could process as many as 20 sacks a day and seemed to have no trouble keeping up with the supply of twigs the men brought them. As many as 299 eggs were counted on a single twig. This came from a spot that shows on the map as 90 per cent infested. They began their work on September 18 and finished on October 20.

"By now," laughed one of them, "I've seen enough butterfly eggs to last me a lifetime!"

"But we were glad to help out," all agreed.

Results of the survey showed that the big spray job must certainly be done the following June.



▲ ASSISTANT PITTS hands the tally tags to Chief Ranger Jack Miller. The figures will be translated into degree of infestation on the map of the region



▲ THANKS TO THIS WORK, the spray team was able to plot its campaign against the pine pest. But the girls admitted that they had seen enough butterfly eggs

The total area to be sprayed was increased to 243,000 acres. A late spring held back the pine butterfly larvae, but the spraying was started on June 8. Six planes operated out of two bases. A Forest Service observation plane accompanied the spraying flights to help control spraying level and observe wind

drift. Below, entomologists' crews walked the forest aisles to count dead larvae and droplets of spray on red sampling cards.

We now wait to see if the pine butterfly will rise again. In the days before these methods were developed, vast quantities of timber would already have been lost.

In the still of night,
a pursuit so relentless
that even a gun
could not deter
the invader

Nest Robber

By ALEXANDER SKUTCH

Illustrations by Don R. Eckelberry

AT dawn, when the placid waters of Gatún Lake in the Canal Zone were ruffled by no waves save those slight spreading ones created by the passage of my slender cayuco, I would paddle to where some caciques were at work.

They were near the end of a long, slender arm of the lake, which reached far inward between two of the innumerable wooded ridges of Barro Colorado Island. A low decaying trunk stood there, a lone remnant of the forest, which had been drowned when this valley was flooded by the impounded waters of the Chagres River. Although its own leaves had long since withered and all its branches had fallen, the stump was verdant with the foliage of a variety of orchids, ferns, bromeliads, and even bushes, which here found a place in the sun; and it was draped and embraced all about, from the water up to the



THE NESTS were being built by Yellow-rumped Caciques, black birds as big as pigeons, with patches of bright yellow . . .

broken summit, with the roots of its aerial garden. Bees had built their hives and wasps attached their nests amid this tangled mass of vegetation; and this flock of Yellow-rumped Caciques (*Cacicus cela*) were weaving their swinging pouches at the tips of the branches of the bush that flourished at the top of the stub, which was about 25 feet high and stood 100 feet from the nearest shore.

They were black birds as big as pigeons, with patches of bright yellow on their wings and rumps and beneath their tails. They had sharply pointed, pale yellow bills. The females closely resembled the males but were smaller and less glossy, with eyes less intensely blue, or even brown on some. These hens went quietly and efficiently about the weaving of their long, pensile nests. They used slender vines and narrow strips torn from palm leaves

and tough vegetable fibers, all brought in their bills from the neighboring forest. When the thin, strong fabric had been completed and the rounded bottom closed, they lined it with silky down from the bursting seed pods of the *bar-rigón* trees on the shore, and soft fibrous materials. They required from six to eight days to weave and line their nests.

As with *oropéndolas*, grackles, and other members of the oriole family (*Icteridae*) which nest in colonies, the males, less numerous than the other sex, gave no aid in the construction of the nest, the incubation of the eggs, or the care of the young. They were brilliant vocalists and seemed to be fully aware of their musical genius. Perching on the coveted top of the trunk, or close beside the nests, or even clinging to their walls, they uttered a variety of beautiful, clear,

liquid phrases, to which I never tired of listening. As they delivered their matchless songs they bowed slightly forward, vibrated their relaxed wings, shook their tails, and raised the bright yellow feathers of their rumps, making them more conspicuous. They spent much time chasing each other about; but it seemed to be all a game, for they never fought and rarely so much as touched each other. If a male cacique occupying the favorite position at the top of the trunk saw a second one coming toward him, he invariably relinquished his perch to the latest claimant.

By the beginning of May, when thirteen female caciques had completed their nests and settled down to incubation, the colony became quieter. Two brown-eyed hens, probably younger than the others, abandoned their nests unfinished. Soon weak cries issuing from some



ALMOST THE FIRST BEAM of the flashlight disclosed a snake—a yellow and gray mica—stretched in sinuous line along the branch

of the pouches, and the food in the bills of their owners as they returned to them, advised me that the eggs had hatched. For a few days the number of nestlings increased and the colony prospered. But then, watching from the cayuco tied to a submerged stump at the head of the cove, I found that some of the nests were no longer visited by the hens. Daily the number of abandoned pouches increased, until half were unoccupied. Since none of the nestlings was yet old enough to fly, it was evident that something was preying upon the eggs and young. But it was quite impossible for me to reach and look into the nests

hanging from the extremities of the slender branches.

During all my hours of watching by daylight, I had never seen any creature molest the caciques, so it was a fair conclusion that the nests were plundered during the night. Accordingly, seated with a companion in the cayuco tied at the head of the cove, I kept vigil as the twilight faded into darkness. The caciques had retired into the forest to roost, leaving, as is their custom, the older nestlings that still survived alone in their swinging cradles. In the dusk the call of the Poor-me-One, most melancholy yet one of the most beautiful of bird

notes, floated out of the woods on the right side of the inlet. Presently the big, dusky bird of night emerged from the trees and flew over the water toward the caciques' colony but swerved to pass it by and continued to the opposite shore. In form and mode of flight it resembled a large, slow-flying hawk, a similarity that quite spontaneously suggested predatory habits.

Could it be that this potoo, this larger relative of the goatsuckers, which I knew only as a soul-stirring voice sounding through the moonlit forest, preyed upon the nestling caciques? I did not want to believe

that a creature with voice so divine had habits so disagreeable; yet this was my first clue to the mystery of the nestlings' disappearance. Pushing the cayuco farther back into the shadow of the trees on the shore, where we would be less conspicuous to the penetrating vision of a night bird, we waited breathlessly. Again the Poor-me-One winged toward the colony but flew above it without alighting, then vanished into the forest. It did not again appear.

We continued to watch in the darkness, hearing only the liquid calls of the frogs along the shore, and once the grunts of some peccaries off in the forest. We waited until the waning moon, rising late, floated up over the crests of the trees on the eastern ridge. But all remained quiet among the caciques' nests; and at last we reluctantly paddled away through the moonlight, the mystery unsolved.

Armed Vigil

The following evening I returned alone to guard the caciques' blighted colony. As daylight waned, the young birds in one of the nests cried out loudly for food, impatiently shaking their swinging cradle; but their mother did not bring them more. All the other nests of the caciques appeared to be deserted now. The pair of yellow-breasted Cayenne Flycatchers were bringing insects frequently to their nestlings in the oven-shaped nursery of straws, situated a few feet above the water among the roots of the air-plants that covered the stump. Still harboring the delusion that the attack on the nests would come from the air, I made a berth for the cayuco among the tall, dense marsh grasses at the head of the cove. There I could wait in partial concealment, viewing the nests in silhouette against the sky. As daylight waned, I loaded the little revolver that I carried for personal protection, the only firearm I possessed, and placed extra ammunition and the electric torch in readiness for immediate use.

On the farther shore of the lake,

at the end of the long, forest-bordered vista down the cove, a massive cumulus cloud rose above the darkening hills, the colors of sunset playing round it. The roseate glow of the early sunset deepened to purple, which was in turn gradually extinguished, leaving the cloud a dull, leaden mass, sharply outlined against the clear amber of the tropical afterglow in the open spaces of the sky. The birds had all retired to their roosts, and the bats began to flutter erratically above the water. The brilliant *Pyrophorus* fireflies threaded their triple illumination through the forest on the shores. The mosquitoes began to buzz and the beetles to boom among the lush grasses around me. Frogs along the shores called in liquid unison, and the Poor-me-One sounded a few weak notes in the woodland but did not fly above the water nor show itself as it had done on the preceding evening.

The afterglow slowly faded from the west, but the stars now shone brightly overhead, with the Great Bear standing up above the mouth of the cove. The caciques' nests and the foliage about them coalesced into a single dark mass, which formed the effigy of a horse with a bushy tail, perfectly black against the starlit sky. Every nest and every leaf that was visible in silhouette remained motionless, and peace seemed to prevail in the devastated colony.

The Culprit

Time slipped by, and since no sign of menace came from the air, I pushed the cayuco out from its bed of grass and paddled toward the colony, into which I threw the beam of my electric torch. Almost the first glance revealed a snake—a yellow-and-gray mica (*Spilotes pullatus*)—stretched in a sinuous line along a branch that supported several nests, now hanging empty and deserted.

Holding the torch in my left hand and the revolver in my right, I fired at the snake, repeating the shots until the magazine was exhausted. Neither the sudden blaze

of light nor the loud reports of the gun seemed to make any impression upon the reptile. Deliberate and impassive as Time, it continued to slither along from nest to nest, each of which it had already sacked and now found empty. Meanwhile the cayuco drifted slowly about; and I found it difficult to keep the long craft in position while I loaded and aimed, all by the light of the torch held in one hand. Again and again I fired, until I had shot off all my 20 cartridges, and the revolver's barrel became too hot to touch. But a snake, even at 20 or 25 feet, is a slender target to hit with a short-barreled revolver in an uncertain light; and when I had exhausted my cartridges the serpent continued its search among the pouches it had already plundered.

Relentless

As a last hope, I threw an extra paddle, then three spare flashlight batteries, all of which missed their mark. There were no stones on the neighboring shores, and I had nothing more to throw at the unheeding plunderer. But I shouted, hissed, whistled, and splashed water, all without effect. There was a horrid fascination in watching this pursuit of prey so concentrated that nothing else, neither noise nor peril nor strange illumination, made the slightest difference. Finally the snake stuck its head into a nest at the end of a twig and emerged with a bulge in its body just behind its mouth. Then it opened wide its jaws and vomited up two eggs, which struck the water with a splash and sank. I concluded that the gluttonous creature perhaps cared only for nestlings, now that it had intruded into the midst of plenty! About this time a steamship, aglow with many lights, slipped steadily through the dark water beyond the mouth of the cove. Its passengers, had they been looking over the port rail, might have noticed a beam of light directed into a low tree by the distant shore; but they could not possibly have guessed the tragedy that the beam revealed to me.

continued on page 330



a
woodchuck
who
needed
TOOTH-
STRAIGHTENING

RODENTS keep a chisel edge on their cutting teeth by sharpening the uppers and lowers against each other. This woodchuck skull shows how the teeth keep growing if something prevents the sharpening

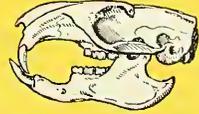
By FRANK GEHR



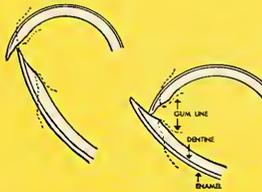
If a groundhog doesn't grind down his teeth, they grow longer and longer

HOW the animal that bore these teeth managed to survive and grow fat remains something of a mystery. It lived near Harpursville, New York; and although its eating habits must have been seriously altered by such an extreme condition of malocclusion, the animal appeared to be in good health. The cutting teeth failed to meet and to be ground down as they grew. The upper teeth curved back around and pierced the bone above the mouth on both sides. The lowers had cut grooves through the flesh of the nose and continued upward to where the animal could keep watch on his own teeth. In some cases, the upper incisors of rodents with this type of misfit come back up, pierce the brain, and kill the animal.

NORMALLY, THIS IS HOW A WOODCHUCK SHARPENS ITS TEETH



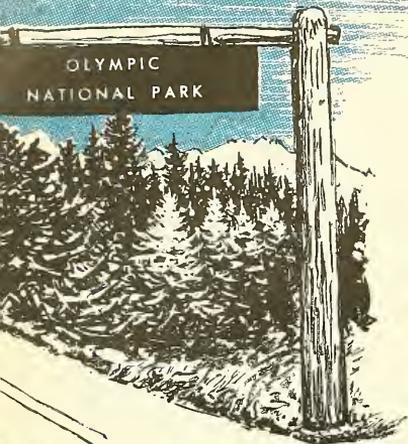
▲ THE WOODCHUCK, like other rodents, can swing its lower jaw far forward to sharpen its cutting teeth. The lower teeth put a sharp edge on the uppers and vice versa



◀ THE HARDER ENAMEL on the outer surface of the teeth wears away the softer dentine in each case, as at left

➤ A LIVING WOODCHUCK with properly formed teeth and face





Lumbermen keep a hungry eye on the beautiful valleys of Olympic National Park—a wonderland that was preserved as public property largely to protect its matchless examples of northwestern rain forest

SUPPOSE you picked up your morning paper and read that the local art dealers of Washington, D. C., were demanding the rarest and choicest collections from the National Gallery of Art, so that they could sell them at a handsome profit to themselves. These dealers, you learn, are not the least concerned with the fact that the museum, one of the world's largest and finest, belongs to the people of the United States. The paper quotes them as brazenly stating that the National Gallery is "too large" and the treasures therein are "locked up" and "serving no economic need." Furthermore, they claim that there are no longer enough art objects left outside the gallery to keep the local art industry fully employed, so it is "in the public interest"

for the American people to turn their most valuable art collections over to the Washington dealers. You read that several bills have been introduced in Congress proposing that the best Mellon paintings and sculpture be transferred to a governmental bureau from which commercial dealers can buy them for a nominal "detachment fee" amounting to a small fraction of their actual value.

If your imagination has not been strained to the breaking point, let us suppose that you then turn to the editorial page and find that your newspaper approves of the art dealers' demands and that local Chambers of Commerce and businessmen's organizations back the move in the name of progress—or, as they quaintly put it, "for the



Shall we
AUCTION
OLYMPIC PARK?

By WELDON F. HEALD



Photo by George A. Grant, courtesy National Park Service

▲ **MT. OLYMPUS** would lose much of its charm without the mighty evergreens that frame it. This scene is from Soleduck-Bogashiel Pass, in the northern part of the Park

greatest good of the greatest number."

Of course, this is all pure fantasy. Art dealers would never be guilty of such a preposterous and high-handed attempt to loot public property belonging to all of us, and I apologize for using them as an example. But the comparison is not far-fetched at all. Change Art Dealers to Lumbermen; Washington, D. C. to Washington State; and the National Gallery of Art to Olympic National Park, and we have a very real case that follows our imaginary one in every particular. The differences are in degree only. The Washington State lumbermen are playing for higher stakes.

What they want to take from us are the magnificent "rain forests" of Olympic National Park. These unique stands of giant trees, growing in almost "tropical" luxuriance, are very nearly the last of their kind

left in the Pacific Northwest. Once gone, they could not be replaced in a thousand years. Olympic National Park was largely created to preserve the shrunken remnants of this once widespread forest. They are of such consummate value and interest that the Park was visited by half a million Americans last year. As the lumbermen themselves are responsible for the disappearance of Washington's rain forests, their presumption in demanding these last priceless samples is staggering.

For Olympic National Park is a living museum of natural treasures. It is a superlative piece of original America owned by all of us and maintained intact and unspoiled for the education, inspiration, and enjoyment of Americans for generations to come. It is the only National Park in the United States that stretches from snow-capped peaks to ocean beaches. From the 7954-foot summit of Mount Olym-

pus to the Pacific shore are four altitudinal life zones, from Arctic-Alpine to Transition, with the varying plant and animal communities characteristic of each. So within the boundaries of the Park there is a matchless exhibition of diverse natural features, including gleaming fields of ice and snow, sparkling alpine lakes, and exquisite wildflower meadows; there are deep twisting wooded valleys, 50 miles of rugged sea coast, and some of the world's grandest evergreen forests. This pristine wilderness is also the home of deer, bear, mountain goats, and some 60 kinds of smaller animals, 140 species of birds, and the largest remaining herds of Roosevelt elk in the country.

But the Park is not kept locked up and jealously guarded behind no-trespassing signs. It is an inviting, friendly wilderness, open to all and easy to explore and enjoy with little effort or hardship. Access

roads penetrate the boundaries here and there, 580 miles of well-graded trails crisscross the forests, mountains, and valleys. There are scores of delectable campsites, and the National Park Service has provided many rustic trailside shelters. So more and more people are coming each year and discovering in the peace, beauty, and grandeur of Olympic National Park an antidote to the ever-increasing tensions of Atomic Age living, for nature is as much a craving within us as is love, art, music, or religion.

The fact that we own such a remarkable untouched natural area is due to a combination of good luck, considerable foresight, and plain hard fighting on the part of conservationists and public-spirited citizens. The first move in the right direction was back in 1897 when President Cleveland set aside some 3000 square miles on Washington's Olympic Peninsula as a forest reserve. One-fifth of this was withdrawn for lumbering four years later, but the remainder became Olympic National Forest in 1907. Part of the area was further protected in 1909 when President Theodore Roosevelt created Olym-

pic National Monument, his distinguished namesake, as a refuge for elk, which were threatened with extinction.

This originally covered nearly 1000 square miles; but during World War I, President Wilson was persuaded to reduce the area by more than half. The pretext was that the nation sorely needed valuable minerals locked up in the Monument. But, surprisingly enough, not a pick or shovel ever touched the land, and again it was the lumbermen who moved in and reaped the profit. The higher portions of the Olympic Mountains were still protected, however. It was the low-altitude rain forests on the west side that were increasingly threatened. A vigorously conducted campaign to save them succeeded when Congress passed the Wallgren Bill in 1938, establishing Olympic National Park; and additions to its area were made in 1940, 1943, and 1953. The particular significance of this hard-won victory was that for the first time in the State's history the people of Washington prevailed against the powerful lumber interests.

But conservation victories are

seldom final, and a good definition of a conservationist is one who never breathes a sigh of relief he can count on.

More vulnerable than ever, the Park stands today as a fresh, green oasis completely surrounded by some of the most wasteful and destructive logging operations ever practiced in this country. A ring of hungry, whining sawmills is closing in, eating up the peninsula's virgin forests far faster than nature can restore them. The end is in sight. The clamor of axes, saws, trucks, and bulldozers is getting ever closer, and once again the rain forests in the Park are threatened. In spite of protective laws backed by enlightened opinion, these last tasty bites are destined to be consumed unless staunch and determined defenders can hold the line at the boundary.

So the time has come for us to act decisively and show that we mean to keep these unique samples of our natural heritage. For, like our democracy, our freedoms, and our customs, our right to enjoy these forests represents "an American way of life," and they deserve our loyalty and patriotic enthusiasm.

▼ WAVE-CUT CRAGS AND ISLETS counterbalance the alpine heights of Olympic National Park. Like all our National Parks, it belongs to the people of the United States

National Park Service photo





W. H. Butcher photo

THE RAIN FORESTS of Olympic cover less than one-seventh of the Park's area



▲ THE OLYMPICS rise in splendid array above deep, twisting valleys. The trees will be safe only as long as the Park boundaries are preserved

Weldon F. Heald photos



▲ TREES OF THIS SIZE might not be the first to go, but one successful attack on the Park's boundaries would almost certainly lead to another

SHALL WE AUCTION OLYMPIC PARK?



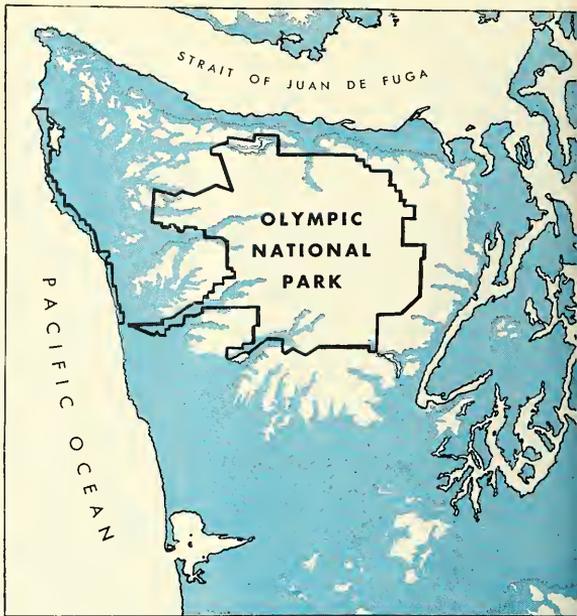


Weldon F. Heald photo

▲ MELTING SNOW AND ICE can damage lower slopes unless absorbed by the roots of growing trees

▼ SOLEDUCK FALLS: one of the beautiful spots in the northwestern part of Olympic Park

Photo courtesy National Park Service



▲ THE BEST TREES have been cut from thousands of acres of Transition Zone topography (pale blue area) outside the Park. Conservationists want to save the slender fingers that still project into Olympic National Park

▼ VIEW in American Museum's diorama of Olympic forest

A.M.N.H. photo





Weldon F. Heald photo

▲ PRECIPITATION totaling 200 inches makes watershed control important in the Olympics. Trees help save the valley soil

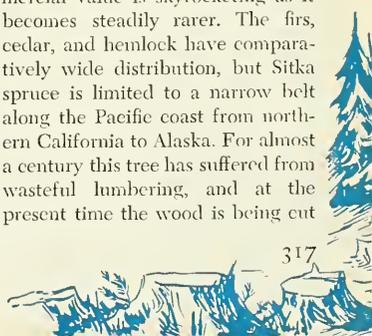
In fact, the Olympic rain forests should stimulate in us an intense feeling of national pride. There is nothing quite like them anywhere else. For sheer exuberance, they have no equal in the temperate regions. The western side of the peninsula is the wettest area in the United States, with 100 to 200 inches of precipitation annually. This falls mostly as gentle winter rains, and it has brought forth through the centuries this amazing forest which rivals the verdure of the Amazon and Congo in riotous luxuriance. The stands of the mammoth evergreens that stretch across the coastal plain and along the low western river valleys into the heart of the Olympics are among the largest in the world. Many of the trees rise over 200 feet high and have trunks more than 10 feet in diameter. Supergiants among them

are the biggest of their kind. Within the Park is a Western red cedar measuring 20 feet in diameter, a Douglas fir 17 feet 8 inches, a Sitka spruce 16 feet 3 inches, and a Western hemlock 9 feet.

Rising straight and clean-boled, these huge conifers interlace their branches 150 feet above the ground and filter a luminous green twilight into the leafy-walled aisles and glades below. Beneath them is a translucent canopy of broadleaf trees and, finally, an understory of tangled vines, maples, ferns, and other junglelike growth. Soft, velvety moss carpets the forest floor; it upholds each rock and fallen log, climbs to the tops of the tallest trees, and hangs in festoons from the arching branches of the maples. Sounds are muted in these great forests; the air is redolent with damp earth and the fresh, clean fragrance

of growing things; and there is an eerie beauty not quite of this world which fascinates everyone who wanders among them.

But the local lumbermen are eyeing these superb forests with increasing covetousness. Past setbacks have only made their appetites keener. What they want primarily is the Sitka spruce, and their attempts to get it will grow in boldness and intensity. This spruce is the distinctive and characteristic tree of the rain forests, and its commercial value is skyrocketing as it becomes steadily rarer. The fir, cedar, and hemlock have comparatively wide distribution, but Sitka spruce is limited to a narrow belt along the Pacific coast from northern California to Alaska. For almost a century this tree has suffered from wasteful lumbering, and at the present time the wood is being cut



more than ten times faster than it is restocking. The day is not far distant when the original stand will be completely gone.

Its very virtues are its own undoing. None of our great timber trees can rival Sitka spruce in multiplicity of uses or surpass it in quality of wood. That is the secret of the trouble on Olympus. Unless we defend these forests, the raids on them will never cease until the last great forest giant crashes to the ground and the final Sitka-spruce nickel rings in the cash register.

Olympic National Park was not two years old when the first skirmish occurred. Lumbermen declared that the rain forests were essential to war needs and applied to the then Secretary of the Interior Harold Ickes to have them withdrawn for logging. He turned down the plea, announced that Sitka spruce was available elsewhere, and proved it. In January, 1943, a raft of 900,000 board feet of Sitka spruce was towed from Alaska's Tongass National Forest to Seattle. This was the beginning of a flow of spruce from Alaska and British Columbia during World War II to relieve the shortage in Washington and Oregon. Conservationists

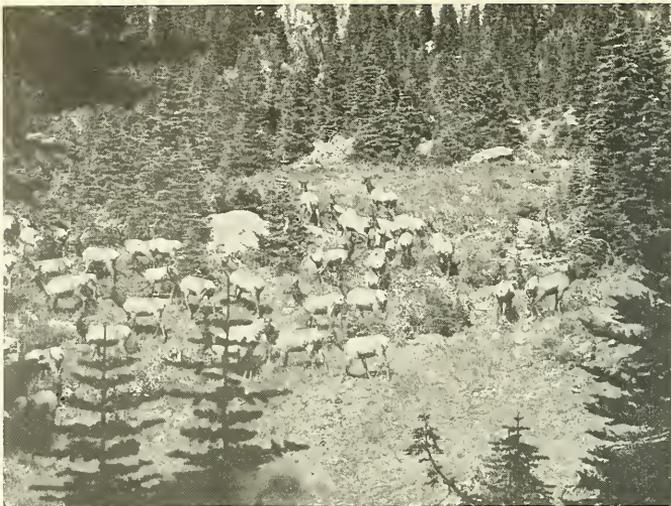


Photo by Weldon F. Heald

▲ THE OLYMPICS are the home of the rare Roosevelt elk. Bears, mountain goats, and 140 kinds of birds also depend upon the Park

breathed easier for the time being. However, a part of the rain forest in the Queets Corridor, now within the Park, was cut under strict supervision of the Department of the Interior.

Patriotism was again invoked to spark the second raid at the end of the war. In 1946, we were told that the returning veterans needed

homes and that it was our duty to sacrifice the Olympic rain forests to this national emergency. A country-wide drive was organized and was nicely under way when even the editors of the western lumber industry's own trade journal, *The West Coast Lumberman*, presumably asked each other, "How foolish can you get?" At any

▼ NOTHING COMPARABLE to the gigantic, moss-shrouded forests of Olympic Park exists elsewhere in the United States

Photo courtesy National Park Service





Photo courtesy National Park Service

▲ THIS HUGE DOUGLAS FIR is protected within Olympic Park



Irving Brant photo, courtesy National Park Service

▲ OLYMPIC NATIONAL PARK was established by Congress in June, 1933. Conservationists have been called upon again and again to defend it

rate, they published figures to show that there was enough lumber in Washington and Oregon outside Olympic National Park to build 73 million 5-room houses, or 2 for every family in the United States. The campaign collapsed, and since then patriotism has been discarded in favor of high-pressure propaganda stressing the economic benefits we plain, ordinary citizens would gain by having our property taken away from us.

Along this new line, the greatest concerted effort of the local lumbermen to get control of the Park's rain forests came in 1947. There was formidable power behind the drive, and the proponents overlooked nothing. The action was spearheaded by seven bills introduced in Congress by Washington State senators and representatives. Five of these bills proposed dismembering the Park piece by piece. The other two were resolutions calling for a special commission to study the Park and determine what further areas should be withdrawn or excluded "in order to render locally and nationally the maximum public benefits." For good measure, the Senate of the State of Washington concocted a fine-sounding memorial petitioning Congress and the

President of the United States to enact these resolutions into law.

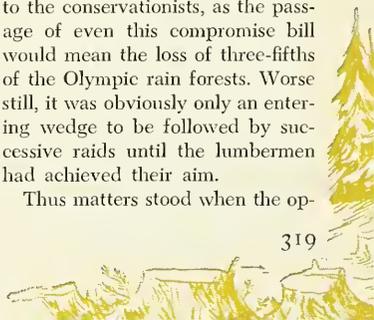
Immediately, thousands of conservationists and socially-minded Americans throughout the country rose in violent opposition to this bald-faced timber grab. Conservation organizations, civic associations, outdoor clubs, garden clubs, and nature groups went into action. Radios, newspapers, magazines, and pamphlets fired thundering denunciations. Letters of protest by the ton piled up in senators' and congressmen's offices. The assault on Olympus had triggered the greatest conservation counter-offensive ever known in the United States. For the first time in history there appeared to be a universal awareness that our National Parks are a vital American institution and that their integrity must be preserved at all costs.

The conservation forces selected as their main targets the pernicious bills setting up a special commission. The full extent of the raid was suddenly revealed. For by this time, the lumbermen frankly indicated that the rain forests alone would no longer satisfy them and that what they wanted was more than half of Olympic National Park's 17½ billion board feet of tim-

ber! The proposed nine-man commission was carefully chosen and heavily weighted in favor of the lumber interests. Eventually it would mean that some 300,000 acres and 10 billion board feet would be eliminated from the Park for their profit.

However, the self-confident lumbermen were caught off guard by the surprisingly stiff resistance and decided it would be better strategy to achieve their goal in two or three progressive bites. So they retreated and made their stand behind a milder bill specifying the elimination of 56,396 acres containing 2½ billion board feet of the finest rain forest. The Department of the Interior and the National Park Service felt obliged to approve this less-threatening bill as an alternative to the dangerously biased special commission. This unexpected desertion by the highly respected custodians of our National Parks was a blow to the conservationists, as the passage of even this compromise bill would mean the loss of three-fifths of the Olympic rain forests. Worse still, it was obviously only an entering wedge to be followed by successive raids until the lumbermen had achieved their aim.

Thus matters stood when the op-



posing forces faced each other at a hearing on September 16 and 17, 1947, at Lake Crescent on the northern edge of Olympic National Park. The meeting was called by the House Public Lands Committee and was attended by representatives of the lumber interests and national conservation organizations. The lumbermen's arguments stressed local and national economic needs, and they recognized no legitimate values or uses for Olympic National Park other than as a source of commercial timber. There remained, they admitted, between 42 and 47 billion board feet in the peninsula's virgin forests outside the Park. But the bulk of this was either on U. S. Forest Service lands and could be cut only under Forest Service supervision, or belonged to large corporations. That, they argued, meant that the smaller local companies, which relied on short-term purchase of stumpage for their requirements, would be forced out of business in a few years with resulting decline in the economy of the peninsula. But if 10 billion board feet of the Park's timber were made available, they declared, local mills would be able to continue indefinitely on a "selective cutting, sustained-yield basis."

The conservationists' testimony emphasized the wider, long-term values of our National Parks. They pointed out that the Parks belonged to some 142 million people (153 million in 1953) and any reduction or change in their boundaries must be decided on the basis of national, not local, interest. Leaving only 1.4 per cent of the country's timberlands as God made them and preserving them in National Parks seemed to the conservationists not an unfair division between preservation and commercial exploitation. As there are still more than 500 billion board feet of virgin timber in Washington and Oregon, as well as many billions of merchantable second growth, conservationists could see no present necessity of surrendering portions of Olympic National Park to meet the country's demand for lumber. They also con-

tended that the long-range economic value of tourist and vacation travel to a national park more than offset the temporary financial gain from the lumber.

They also challenged the lumberman's statements that cutting the timber of Olympic National Park would put the peninsula's economy on a sound footing. It would be only a temporary relief, not a permanent solution. The annual capacity of the local sawmills was 1.2 billion board feet, and all the timber in the Park would not support cutting at that rate for more than a few years. Finally, they doubted that an adequate sustained-yield program could be worked out, for modern high-line logging and selective cutting are incompatible. Therefore, the sooner the Olympic peninsula lumber industry adapted itself to changed conditions, the fewer dislocations and adjustments there would be. The conservationists wound up their case with the charge that the shortsighted and unsound practices of the Olympic Peninsula lumbermen were responsible for "the grave economic wrong" that was being visited upon the region, and that their mistakes should not be made good at public expense. They must solve their own problems by bringing into line the rate of cutting with the rate of growth. Only in that direction lay any permanent solution.

In fact, the conservationists made such a strong stand and pressed their points with such telling effect that they won a signal victory. As a result, Secretary of the Interior Krug withdrew his support from the compromise bills and announced that he would oppose any boundary reductions in Olympic National Park. Washington's Representative Henry M. Jackson, sponsor of the compromise bill in the House, stated that he was against any further measures proposing eliminations from the Park. And Senator Warren G. Magnuson, author of another of the bills, henceforth became a staunch defender of Olympic National Park and approved

continued on page 336



▲ A FEMALE CYCLOP with egg sacs

CYCLOP

IF you take a jar of water from any pond, ditch, or lake and hold it against the light, there is a good chance that you will see little dots moving back and forth, up and down. Among them there are likely to be some little animals which through a hand lens, seem to be especially active and fast-moving. They are Cyclopes, little creatures with one eye. They were named after a terrible race of one-eyed giants who, if we can believe the Greek poet Homer, gave much trouble to Ulysses on his way back from the Trojan War.

Cyclopes are very prolific animals. They have to be in order to survive, because they form an important link in the food chain. Feeding on protozoa, diatoms, and desmids, they are themselves food for all kinds of small fishes. It has been calculated that a single female would give rise to three million offspring during one year if there were no losses among the many generations. The females also exceed the



The prolific female Cyclops would produce three million one-eyed offspring a year if there were no losses

production

By ERIC V. GRAVE

males by a great margin. Some species reproduce all year-round but especially in spring and summer.

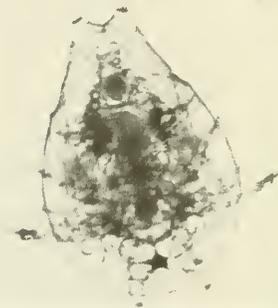
The female starts laying eggs shortly after mating. The eggs come out of two oviducts on the sides of the abdomen and are fertilized as they pass a seminal receptacle into which the spermatozoa have been deposited during copulation. A gelatinous matter is secreted to form a sac in which the eggs are held together. During her lifetime, a female may produce up to 13 pairs of ovisacs, each consisting of up to 50 eggs. In general, the spermatozoa in the seminal receptacles are sufficient to fertilize all the eggs laid by the female during her lifetime.

The Cyclops undergoes a long and complicated body change. The newly hatched larva, called Nauplius, looks very different from the adult animal and was for a long time considered a different genus, though as early as 1699 Anthony

van Leeuwenhoek, the Dutch microscopist, suggested their relationship. The larvae undergo eleven and in some species twelve moltings. When the young animal hatches, it is oval and has three pairs of appendages, which later develop into two pairs of antennae and the mandibles. The appendages in the Nauplius stage serve as swimming organs. After successive moltings more appendages appear, the swimming feet. These later enable this little animal to shoot through the water with surprising speed. The hind end develops, dividing the body into two parts, and finally the adult stage is reached. The animal is then a streamlined, elegant creature, about one millimeter in length from eye to tail.

At high temperatures the development from the fertilized egg to the moment of hatching takes as little as twelve hours. In winter, five days were observed to elapse. The metamorphosis as well depends greatly on temperature.

◀ THE SAME ANIMAL a few minutes later. Delivery is in full swing. One of her little offspring can be seen on the left side of the picture, making its way cautiously over the slide. It sees the light of a 2000-candle-power microscope lamp. The female and larvae are here shown at about 110 times normal size



▲ AN EARLY NAUPLIUS stage from the same culture. The larvae go through eleven or twelve molts

▼ A YOUNG ADULT female Cyclops. She is smaller than a pinhead, but she may produce as many as 500 eggs during her life. At high temperatures, the eggs can hatch in as little as 12 hours, and the generations fan out rapidly if nothing kills them



How man overcame some of nature's most frustrating obstacles
to gain a vital element for industry and agriculture

Sulphur—

For Our Way of Life

By JENNIE E. HARRIS



O. Winston Link photograph, Freeport Sulphur Co.

▲ SPRAYING THE MELTED SULPHUR into a storage vat. Layer by layer the sulphur builds up, solidifying when it cools

A VISITOR from another planet might well exclaim, "Your civilization depends upon sulphur, yet no one I talk to knows anything about it. How can people be so ignorant of a substance of which about 75 pounds are used each year for every man, woman, and child in your land?"

This most versatile of all chemicals, and one of the cheapest—about a cent a pound at the mines—is also one of the oldest. The ancients called it "burn stone," the stone that burns. For centuries its blue flames were believed to kindle the furnaces of Hell.

"Flee for your lives," angels warned Lot. "Take your wife and your two daughters and escape, for we will destroy this place." As soon as Lot fled, brimstone and fire rained terror and destruction upon the two wicked cities, Sodom and Gomorrah. Thus even in Biblical times sulphur seems to have been known.

Sulphur bleached the linens for priests' robes and mummy cements in long-ago Egypt; it entered the brilliant paints and pigments that decorated temples when Menes was king. Sulphur was also a purifier. Homer had Odysseus burn sulphur after slaying his wife's suitors. "Burn sulphur, burn sulphur," screamed primitive man, stooping over yellow rock in a cave and igniting a blue flame to chase away evil spirits. "Let me burn enough sulphur," Cagliostro boasted to Marie Antoinette, "and I'll turn any base metal you bring me into gold."

About 100 trillion tons of sulphur exist in our oceans. Sulphides, nature's combination of sulphur with the metals and semimetals, abide deep within the earth. Meteorites from outer space bring evidence of their own sulphur in nodules of their own sulphur in nodules of triolite, an iron sulphide. Volcanoes spew out sulphurous gases; mineral springs gush forth hydrogen sulphide gas and sulphates. Vegetation requires sulphur, which means that sulphur is in our coal and petroleum deposits, too; and in our



Leon Trice photograph, Freeport Sulphur Co.

▲ THE HARD, BRIGHT YELLOW SOLID is brought up molten from deep wells. All the sulphur wells of the Freeport Sulphur Company in the region shown here are drilled from floating rigs. These rigs cost a quarter of a million dollars each. The rigs are kept busy, because each well can remove the sulphur from only about half an acre.

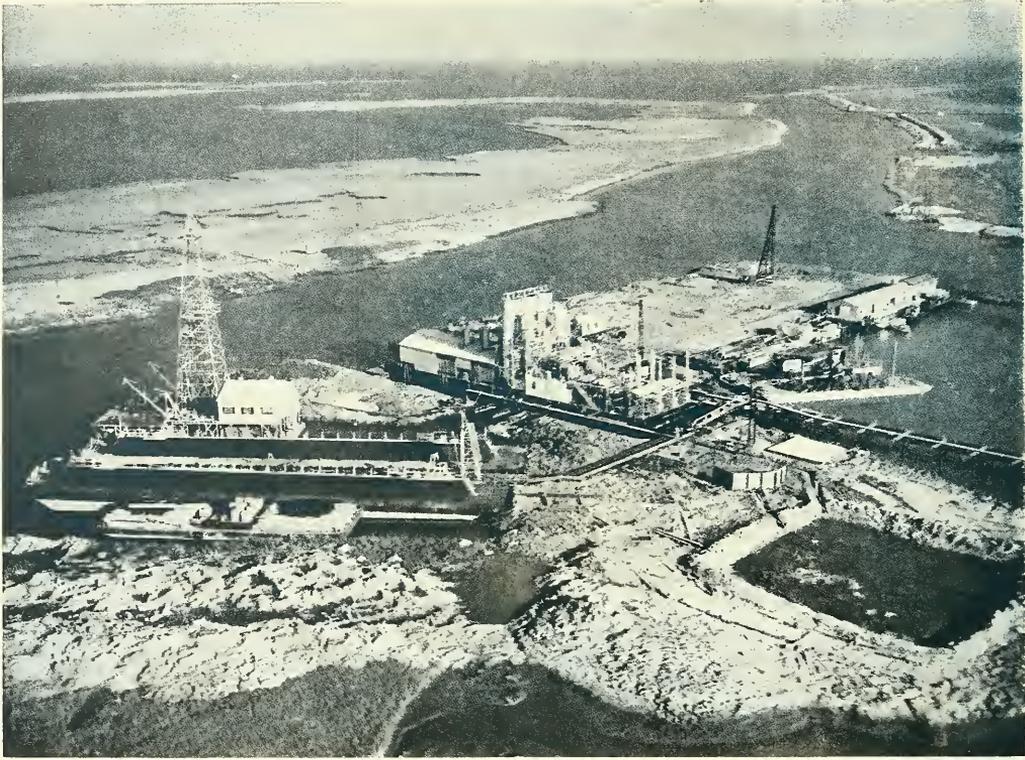
food, both vegetable and animal; in our tissues and fluids.

But sulphur-mining in the United States developed comparatively recently. Mines exist mainly in Louisiana and Texas, in strange geologic formations.

Far down below the coastal plain of the Gulf of Mexico stand pillars or plugs of rock salt. Some pillars

are more than a thousand feet below the surface, others but a few hundred feet. All hold up, as it were, a thick roof of gumbo, sand, and clay.

Sea water evaporating millions of years ago left salt—a vast mother bed of salt lying perhaps 20,000 feet below sea level. Upward and downward pressures, through geo-



Freeport Sulphur Company photo

▲ A FLOATING MINING PLANT in a sulphur operation that is wholly marine. At left are two tanker barges that carry out the sulphur in molten form to storage

75 miles away. There is no stable land here at the Freeport Sulphur Company's Bay Ste. Elaine operation, located on the coast of the Gulf of Mexico

logic eras, combined, men believe, to force some of the salt upward into pillar-shapes. These stand straight, smooth, sheer—as though guarding the entrance to some giant underground coliseum.

Covering the tops of the plugs of halite (rock salt) are several layers of cap rock composed of anhydrite, gypsum, and limestone. It is chiefly in the pore spaces or in solution cavities in the limestone that the yellow crystals of sulphur occur. These cap rocks have most likely been torn loose and brought up from below by the forces that produced the salt plugs and were thus carried upward on top of the disrupted salt formation. Again, there seem to be some extensive sulphur deposits that are in the form of a bed about 100 feet thick under 300 or 400 feet of sediment-

ary rocks and not related to the salt domes mentioned above.

Men drilling for oil in the Calcasieu Parish, Louisiana, in 1867, came upon the yellow evidence of sulphur. "Look! Pure sulphur!"

They found it in a dry ridge rising about eight feet above a cypress marsh, where not many years before, a physician digging a well near by had found a petroleum seep. Now the Petroleum and Coal Oil Company drilled down, down, pierced cap rock, found crystals of sulphur, gypsum, more gypsum, but no oil.

Puzzled, they consulted Professor Hilgard of the University of Mississippi and were surprised at his excitement. "Not much future in petroleum here," he exclaimed. "But think of the future in sulphur!"

Our industrial sulphur had all

been coming from Sicily. On that mountainous little island, sulphur existed near the surface and could be mined as a solid. Sulphur in Louisiana! How it could boost industries—paper, pulp, petroleum!

"But how are we going to bring it up? It's down there under hundreds of feet of quicksand!"

Ordinary mining methods failed. A French company shipped a huge caisson from France in sections, then tugged it and rolled it to the island—and abandoned it when hydrogen sulphide fumes suffocated five of the miners.

Other companies—Austrian, American—formed and failed. Quicksand and clay swallowed up every effort the way they also swallowed up hundreds of thousands of dollars in the ventures. Probably a thick, rich bed of sulphur existed

down there, definitely needed in the economy of the United States, but how to get it out of those ogre depths?

While these companies labored, a brilliant oil scientist on vacation from the Standard Oil Company in Cleveland, Ohio, was quietly drilling only a mile and a half away. He was Dr. Herman Frasch, who had already discovered a way to desulphurize petroleum. He had a simple suggestion. "Why not heat water above the melting point of sulphur, pour it down on the crystals, and pump up sulphur as a liquid?"

Simple; but the soft sands would move in, plug up pipes. How could you penetrate to any depth?

Dr. Frasch and the Union Sulphur Company, who now possessed the mine title, worked against terrific odds. New problems in physics and geology arose to confront them. Just getting enough hot water to the well and down it, still hot, was like cleaning out an Augean stable.

But in 1894 came the first flow

of sulphur from the Calcasieu deposit. Gold-brown, transparent. The warm liquid heaved a little—and settled. Dr. Frasch stroked his beard. He had done it! He had brought up sulphur from 1100 feet, through all those treacherous deposits of quicksand and clay.

Eight years of discouragement, heartache, heartbreak followed before the Frasch process became established. Dr. Frasch died in Europe in 1914, but not until after he had been acclaimed Father of the American Sulphur Industry. All in all, he was granted 64 patents. Through petroleum, other chemicals, and sulphur, he increased our national wealth by millions of dollars.

Today, most of our elemental sulphur is mined in the Frasch way. Men steam for sulphur. They drill a well straight down through maybe a thousand feet of sedimentary rocks, till they touch the bottom layer of cap rock. They run a six-inch pipe down to this depth. Then inside this a three-inch pipe reaches

almost to the bottom of the sulphur-bearing stratum; and inside it, a one-inch pipe reaches almost to the second pipe's depth.

Water heated above the melting point of sulphur (which is about 240 degrees F.) is pumped down between the two larger pipes. It flows through perforations into the surrounding sulphur crystals and melts them. The melted sulphur, heavier than water, sinks and forms a pool in the bottom of the well. Water pressure forces it up several hundred feet in the middle pipe; then compressed air released in the inmost pipe raises it the rest of the way.

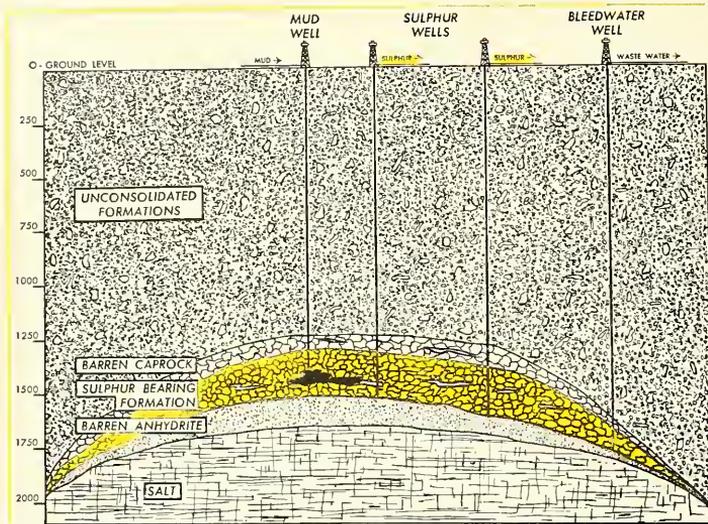
It enters steam-heated sumps, is measured and pumped into storage vats. Layer by layer, more sulphur enters the vats, to cool and solidify till each vat is full. The sulphur becomes a solid yellow block, which must be blasted for shipment.

In Texas and Louisiana, hills of solid sulphur line railroad tracks, each vat with its own track. Vat walls may be made of sheet metal,

▼ A STEAM-JACKETED PIPE carrying molten sulphur from the sump, or collecting station, to the vat areas

Henry Southerland photo





Courtesy Freeport Sulphur Co.

built up and broken down in rotation; or the walls are solid sulphur, strong, waterproof, enduring—1300 feet long, 160 feet wide, hills of pure yellow rising 50 feet against the blue sky. Each vat holds a half million tons of solid sulphur.

Each day the flow of sulphur into a vat is spread evenly over the whole surface to insure uniform cooling. Too much sulphur flowing too fast into one spot could cause pockets of liquid encased in the solid. For shipment, a vertical block 12 to 20 feet thick is removed at a time and broken into desired sizes for transportation by rail or water.

Millions of dollars in investment go into a sulphur well in the form of power plants, reservoirs, generators, compressors, derricks, and drills. There must be new pipe lines often, for each well can take in only the sulphur around it, about a half acre. New wells must be sunk, new pipes laid, before the old wells are abandoned.

A map of the wells drilled into the Calcasieu deposit looks like a whirligig of pin points. By 1924, that deposit was abandoned, but not before it had yielded 9,400,000 tons of pure sulphur. The original mines of the four great mining companies have all been abandoned—Texas Gulf Sulphur Company,

Freeport Sulphur Company, Duval Texas Sulphur Company, and Jefferson Lake Sulphur Company.

Swampish surroundings and cave-ins add to the expense of mining. Some wells last only a few weeks, others a year or more. The longer men work a well, the weaker its supporting rock, though some subsiding helps. "Bleed" wells carry off surplus water; mud wells force mud into gaps.

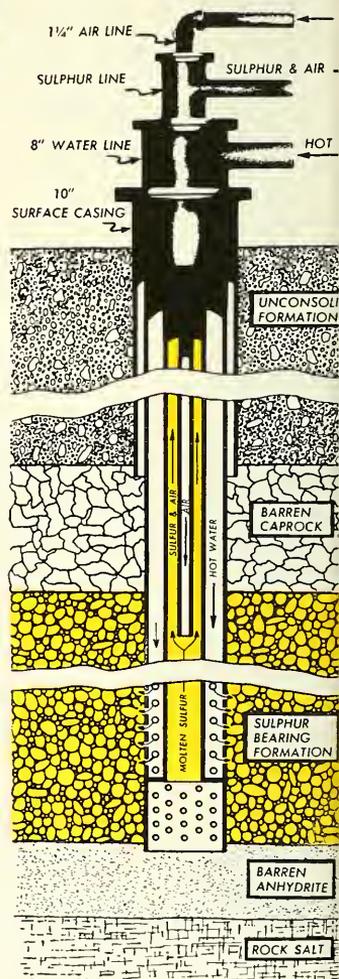
"We're shoving off to another well. This one's giving out." Replacement wells are sought constantly, then drilled. But much equipment stays permanent, such as reservoirs that hold millions of gallons of water (two to eight million gallons pumped into a sulphur deposit a day). There are permanent power plants, thousands of feet of pipes between plant and mine field, steel derricks, laboratories, storage and loading facilities.

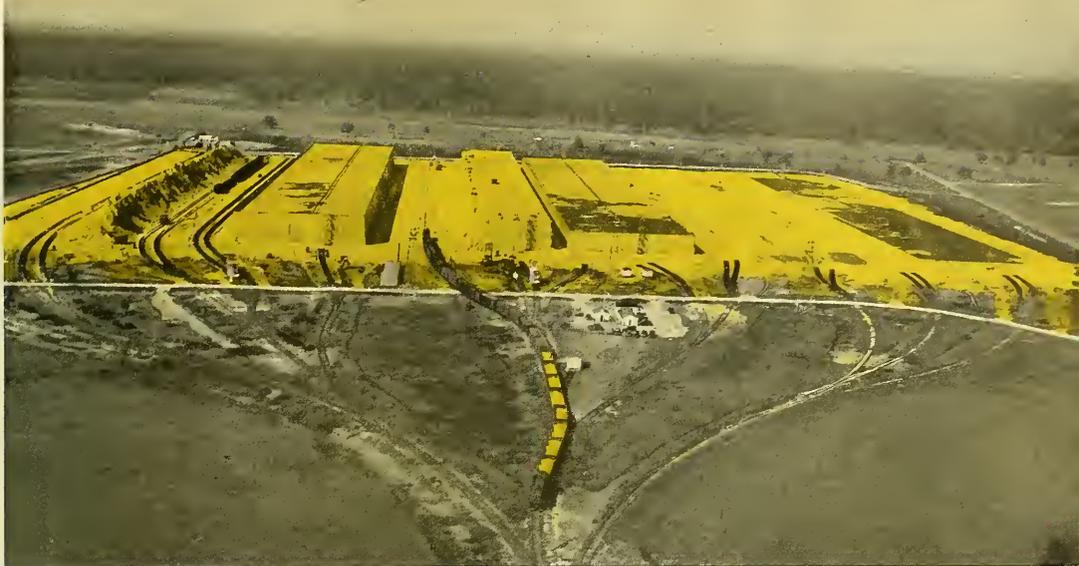
Permanent, too, are the sulphur towns, homes of workers and their families. New Gulf (Texas Gulf Sulphur Company) has 300 residences, a community house, an atheletic field, a golf course, churches, high-ranking schools, a large public library, a modern hospital.

Port Sulphur (Freeport Sulphur Company) boasts of comfortable

◀ MUCH OF OUR SULPHUR in the Gulf Coast region lies in dome-shaped layers above deposits of rock salt, 1000 feet or more below the earth's surface. The difficulty of removing it long kept us dependent upon Sicilian sulphur

▼ DR. HERMAN FRASCH turned from sulphur mining to sulphur "pumping" by discovering the water method of removal. In this diagram, hot water under pressure (100 degrees F. is pumped down the bleed pipe to where the sulphur is. The water melts the sulphur and flows up inside the middle-sized pipe, 10 inches in diameter. Several hundred feet higher in the well, compressed air released in the innermost pipe pushes the sulphur the rest of the way





Newsulf photo

▲ **HUGE BLOCKS OF SULPHUR** are built up between railroad tracks that give access for shipment

homes, playgrounds, a community house, swimming pool, schools, stores, churches, all well equipped. Employees ride to work in streamlined Diesel launches.

Jobs last all year, require steady watchful work. The sulphur must never have a chance to cool and freeze in the pipes. Dredges must keep pumping in mud to avoid underground cavities. Water, heat, pressure require minute by minute adjusting. Laboratories control the entire process.

Magnetometers, gravity meters, seismographs help locate the hidden domes over those strange pillars of salt. "There's a salt dome, for sure." Men drill it in hope of oil—and in a few cases have come upon sulphur. Of 200 or more domes thus far discovered in Texas, Louisiana, and Mississippi, only 12 have been found commercially practicable. Of these, five have already been exhausted.

Even when men learn where sulphur is, they must drill into it time and again before they can feel sure of the amount present. There is always a vast risk. The Freeport Sulphur Company sank \$4,000,000 into Grande Ecaille mine before receiving any degree of proof that its sulphur would justify further effort.

Time was when the Grande Ecaille was nothing but marsh. The salt dome, about 35 miles below New Orleans, lay below salt grasses matted to a thick fiber. Here red-winged blackbirds migrated by the tens of thousands. Here herons stood motionless on stiltlike legs, and mosquitoes swarmed like fogs.

Drilling penetrated 1250 feet of sediment to cap rock and its inner layer of treasure. But how could they build a plant in this forbidding place? No fresh water for miles around. No highway or railroad near. Tides and hurricanes threatened. Mosquitoes menaced like mad. The two million gallons of water to be heated every day to melt the sulphur would have to come from the Mississippi River through a ten-mile canal. And men must excavate for a reservoir to hold 50 million gallons.

They built the plant directly over the salt dome, where any dropped tool was lost forever. "Whoops! She's a goner!" The marsh was so sucking-soft that foundation-piling 75 feet long sank half its depth without aid of a pile driver. The only way to hold up piling was to drive it so deep that friction did the trick. The plant had to be

anchored in concrete to withstand hurricane force. Then land that made way for the reservoir built the town, Port Sulphur.

Facts About Sulphur, by the Texas Gulf Sulphur Company, gives an impressive list of industries and products requiring sulphur. You can scarcely name an industry not included. There is the whole alphabetical list from acids and alcohols, through food preservatives, fumigants, glue, glycerin, pharmaceuticals, and plate glass, to water purification. Acids and chemical industries use greatest amounts. Next in order come superphosphate, ammonium phosphate, pulp and paper, rayon, rubber and agriculture.

We'd be in a sorry state without sulphur. It is back of our crops, our newspapers, magazines, books; back of every car on the highway, back of its steel, upholstery, the oil and gas that run it, its safety glass, its antiknock—30 pounds of sulphur for every automobile.

Sulphur helps make our enamel kitchenware, our tin cans for food, our plastic cloths and drapes, canister sets, refrigerator dishes. It enters the making of camera film and film for motion pictures and X-rays.



Robert Yarnall Richie photograph

▲ **SOLID SULPHUR**, gleaming golden under the southern sun. The element that the ancients valued as a fetish now costs only about a penny a pound at the source yet plays a vital role in almost every important industry

It helps make dyes, fats, oils, soaps—tens of thousands of products. Wipe these from our civilization, and where are we? Sulphur is in the recovery of bromine from sea water—the bromine needed in medicine, photography, and the whole petroleum industry. Sulfa drugs, rushed to battle victims, have saved

thousands who would have died in earlier wars.

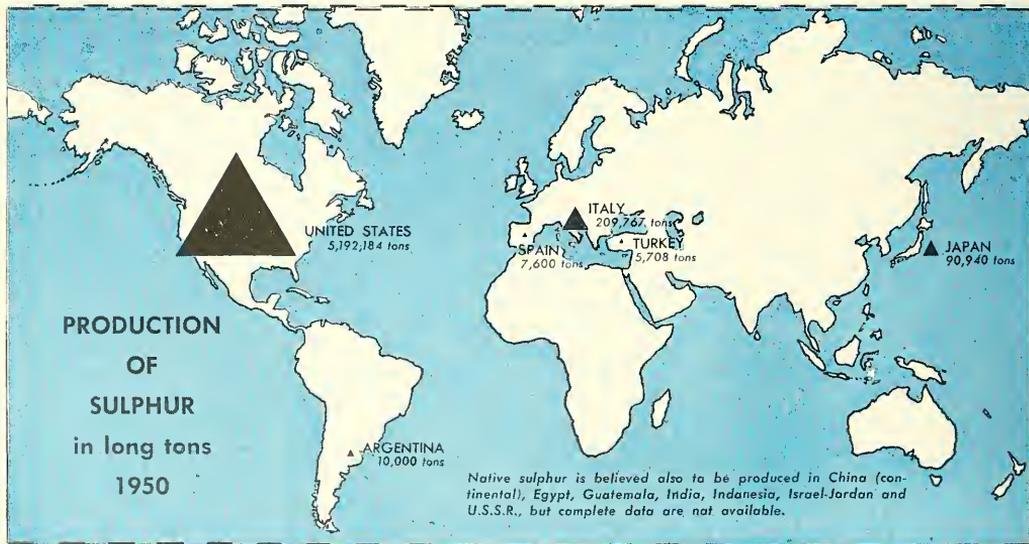
These enormous, spectacular uses of sulphur have spurred scientists to try to extract it elsewhere. Germany found a main source in coke oven gas before World War II. Norway got it from pyrites by smelting—United States, Britain,

Canada, the Far East gain amounts from natural gas and petroleum refinery gases. Oil refineries have their own sulphur recovery plants, regenerate their used sulphuric acid, break up hydrogen sulphides obtained by distilling crude oil—cool and solidify the hot sulphur in vats.

Still, sulphur from buried deposits stays cheapest, simplest, and best. Gulf Sulphur is King in U.S. and world markets.

About 80 per cent of our elemental sulphur goes into sulphuric acid. Sulphur has no odor; but sulphuric acid—you can smell it a thousand feet away! Sulphur is a mild laxative. But sulphuric acid would eat out your insides; it even eats metals. Men burn sulphur to get sulphur dioxide and convert this into the acid. It is heavy, oily, fummy, and burns painfully. Men who work with it take many precautions.

Yet a third of all the sulphuric acid made feeds the earth. About 100 years ago, farmers realized that the ground-up bones that make good fertilizer are even more useful to plants if mixed with sulphuric acid. The acid makes the phosphorus of bones available to the tiny mouths of roots. Acidulating bones became big business in Eng-



land. Old-time cemeteries were ransacked for bones. Mummies from Egyptian tombs arrived by shiploads in England. "Are those mummies for museums?" "No—for you, eventually." The mummies were ground up for fertilizer.

When men discovered phosphate rock in South Carolina in 1868, and in Florida in 1885, the fertilizer business in America gained impetus. Crushing rock was better than shouting "Old bones!" in streets. In time, acid-treated phosphate became "super-phosphate." Plants could assimilate it easily. The fed soils feed vegetables and fruits, which in turn feed us.

For paper alone, the United States and Canada together require 700,000 tons of sulphur a year. The magazine containing this article required sulphur for paper and ink. Sulphur dissolves out resins, gums,

and other impurities in the wood pulp—250 pounds of sulphur to 1 ton of sulphite pulp, basis of our paper industries, newspapers, writing paper, wrapping paper. Basis also for rayon and all fabrics metamorphosed from coal, oil, and water.

Count Hilaire de Chardonnet, pupil of Pasteur in France, is credited with starting rayon. He was helping Pasteur overcome a disease that threatened silkworms and asked, "Why can't we make a spinneret machine on the order of the silkworm's spinnerets? Force colloid through the holes and get a silky thread?" So he devised a spinneret.

In 1893, three English chemists, Cross, Bevan, and Beedle, treated cellulose with caustic soda and car-

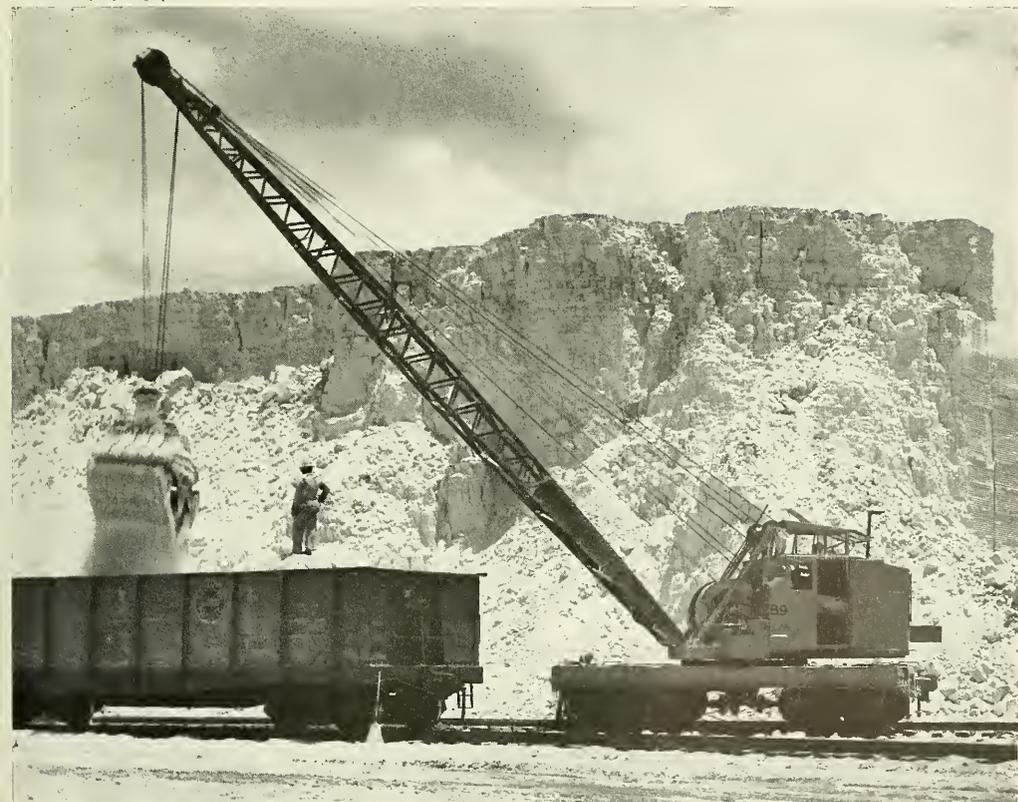
bon bisulphide. "Look at that fine silky film!" In 1908, a French chemist built the first practical machine for producing this transparent film. That is how cellophane began.

Sulphur prepares and dissolves the wood pulp for rayon. Its acid bath fixes rayon threads; the dyes it helps make give rayon its soft pure colors. Rayon has been spun in finer and finer filaments and given added strength by simple stretching. Now it enters high tenacity cords for bomber tires, packs pump rods and plungers, insulates telephone and radio wires.

In 1839, you could have found Charles Goodyear cooking sulphur with white lead on his kitchen stove. He knew how people detested rubber—those suddenly popular rubber shoes and mackintoshes

▼ AFTER THE SULPHUR has been deposited in the melted form, it sometimes has to be blasted so that it can be loaded for shipment

Elwood M. Payne photograph



that hardened and cracked in winter, turned sticky in summer, and smelled to high heaven. "No more of that rubbery stuff!"

Goodyear experimented till he hardened rubber. Literally, from his kitchen stove sprang the whole rubber industry—tires, inner tubes, rubber heels, water bottles, rain-coats, jar rings, floors, gloves, bathing caps—a multimillion-dollar business.

Apart from sulphur's use in superphosphate, ammonium sulphate, potassium sulphate, sulphur itself is a fertilizer. It stimulates root growth, encourages seed formation, makes for plant vigor. Those sickly stunted plants that seem to have yellow fever or measles sometimes

need sulphur. Sulphur controls insects, too, as every farmer knows.

We cannot drink sulphur from the soil, as plants do; but it nurtures us all the same. Amino acids containing sulphur build our body tissue, make up part of our skin and hair, strengthen our physiological functions.

War makes huge demands upon stores of sulphur—because of explosives, increased crop goals, refined oils for aviation. Blasting gelatin and TNT have sulphur in their making. But peacetime uses require at least five million tons of sulphur a year, for the makings of our civilization.

Spain's sulphur comes from pyrites. Chile's is in the Andes, up

18,000 feet, where miners dig in terrific cold, almost freezing their hands. The bulk of our sulphur is Gulf Coast, from Frasch-processed mines. Here the yellow rhombic crystals, like cool jewels embedded in limestone above pillars of rock salt, are melted and brought to the surface.

The birth of every new industry means another role for sulphur. A new method may temporarily decrease the need for sulphur, then all of a sudden sulphur leaps into a formerly unknown role. Recently a new sulphur dome was discovered in the Gulf. To what unfamiliar uses will some of its sulphur be put tomorrow? No one dares predict.

NEST ROBBER *continued from page 309*

When it had completed its search among the abandoned pouches on the side of the bush where they hung closest together, the serpent slid across to the opposite side of the colony, where hung the only nest that I knew to be occupied,—its nestlings now ten days old. I had fired my last shot and hurled the last detachable object that I could spare, and still Death advanced relentlessly toward its goal. The wasps and bees whose nests were plastered or suspended all over the tree did not sally forth to punish the invader, which slipped too smoothly and silently over the boughs to arouse them from their night's repose. Nor did it occur to me until later that I might have stirred them to fury by hammering against the trunk. What I had already seen was sufficiently distressing to a bird-lover, and I had no desire to witness this nocturnal drama to its tragic end. I turned the prow of my little vessel toward the open lake and with heavy heart paddled away into the darkness of the night, leaving it to cover an act that no true friend of birds would willingly behold.

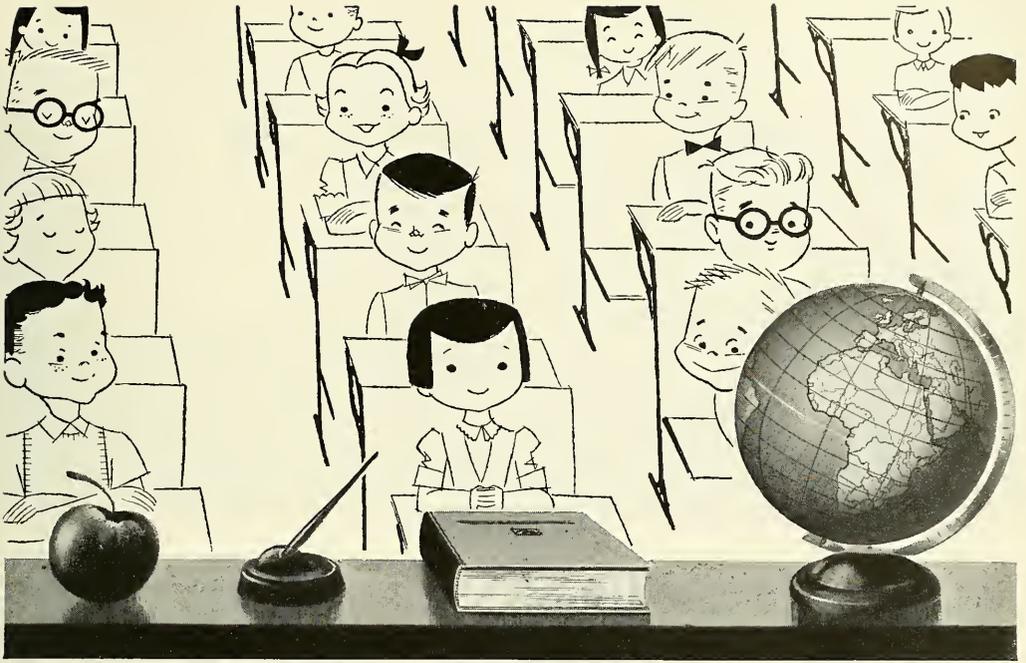
Next morning I returned to make another effort to dislodge the snake from the blighted colony. Even if the last of the caciques' nestlings had been devoured, I might at least

save the young Cayenne Flycatchers in the nest among the roots near the water level. I concluded that the snake, easily swimming across the water upon which the caciques had foolishly relied to protect them from the attacks of terrestrial enemies, had climbed to the top of the stub by way of the roots draping it all around. Then, after cleaning out some of the nests, it had made its lair in a deserted pouch by day, to sally forth and plunder others while darkness shielded it from the attacks of hawks and prevented all possible defense by the purely diurnal caciques. So it would continue until the last egg and nestling that the tree held had been devoured.

But as the cayuco drew near the head of the inlet, to my amazement I beheld the snake hanging head downward beside one of the caciques' abandoned pouches. A nearby nest, contrary to my expectation, still cradled living nestlings; and their mother, devoted bird, was carrying food to them, less than a yard from the motionless body of the destroyer. On the neighboring shore I cut a long pole and managed to pull down the snake, which had already begun to putrefy. There were three bullet holes in its posterior half, through one of which the viscera extruded! The serpent,

in its death writhings, had tied a tight knot in the hinder portion of its length. With a lack of sensibility that one would hardly expect to find in any living thing, the ravening snake, which might easily have dropped into the water and swam unharmed away, not only continued its search for booty after being thrice struck by bullets but even swallowed two eggs when mortally wounded, which probably explains why it had disgorged them.

The nestlings, which I had supposed to be doomed when, my last shot spent, I left the serpent advancing toward them, also miraculously escaped destruction; and their mother continued faithfully to attend them. Other female caciques, recently bereft of their young, still came to the colony bearing food. After delaying a while, they would swallow this or carry it off again in their bills. Still others came to peer into empty nests or cling to their sides. Despite all that these poor birds had endured, their attachment to their nests and young remained unshaken. Nor did the males, although they took no active part in caring for the nestlings, utterly desert the stricken colony. Until the last youngster could fly, they came at intervals to pour forth their mellifluous songs among the swinging empty pouches.



They're waiting for the teacher

... maybe it's you!

Ever think you might make a good teacher?

Ever consider how much satisfaction there is in helping to mold and guide the personalities and futures of young Americans?

Today, you have an unparalleled opportunity to enter one of the finest and most respected professions in the world. It's a profession in which you, yourself, can develop and use your talents to their fullest.

And it's a profession that needs you—because the kids need you.

America's postwar babies have suddenly started

pouring into the schools. In fact, there are so many of them that, today, the elementary schools alone need *over 70,000 new teachers a year* to handle these children.

By 1960—with over 8 million more children entering our schools—the need for qualified teachers will be even greater.

So think it over. Think of what it will mean to you—to your community—and to America, when you decide you're going to become a teacher.

The kids, too. They're waiting for you to make up your mind. They're hoping you'll say, "Yes"!



BETTER SCHOOLS BUILD BETTER COMMUNITIES



▲ THE GRACEFUL PRONGHORN inhabits both the prairie and the bordering foothills

"The Vanishing Prairie"

"The Vanishing Prairie" is Walt Disney's most recent feature-length True-Life Adventure. The drama deals with the vanishing wildlife of the American prairie, whose birds and animals were brought to the verge of extinction and yet manage to continue their stubborn fight for survival. The setting for the story is that expanse of territory from the Mississippi to the Rockies and from the Gulf of Mexico to the plains of Canada.

"The Vanishing Prairie" employs the

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES



action and drama that nature stages for those who have the skill and patience to haunt the proper setting," writes Dr. Harold E. Anthony, Deputy Director of the American Museum and Chairman of its Department of Mammals. "It combines the pick of the film exposed by many naturalists, working over a long time and capitalizing on every lucky break. It therefore includes a surprising series of sequences. Those who see this film are treated to scenes that would require the span of a lifetime if one individual were to see them all as a firsthand observer. The publicity calls this concentrated 70 minutes of wildlife activity 'true life adventure.'

"The film is exciting, it is instructive, it is highly entertaining, and, in the opinion of this reviewer, the fact that it is double distilled should not detract from its popular enjoyment if it is stated that 'true' carries a somewhat special connotation in this case. Certainly the

camera records only what is actually happening, and all is 'true' to this extent. However, the direction of the film has called for some setting of the stage, some liberties with time sequences, some limitations on the freedom of the animals, and in other ways permitted man to work his will. An extreme example of the human influence is the musical background for the fighting rams. This is a clever bit of synchronization but with a touch of sophistication that some will consider intrusive in a 'true life adventure.'

"Even though large mammals are first among the protagonists," writes Dr. Robert Cushman Murphy, the celebrated authority on birds, "the ornithological episodes are beautiful and haunting beyond description. Walt Disney recognizes and makes use of the fact that bird behavior is stylistic to a degree surpassing that of other creatures, attaining, indeed, a pinnacle as lofty as the conscious creativeness of man. In this film we see new aspects of the gorgeous water-frenzy of grebes in love, the rigidly restrained dance of the sharp-tailed grouse, which

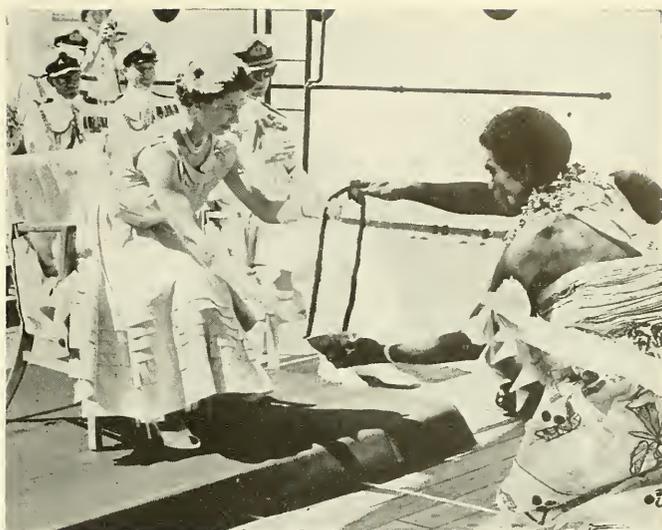
◀ A COYOTE ready to prowl the grass-land in Disney's new film "The Vanishing Prairie"

look as though the cocks were copying Indian braves (actually it is the other way), and the floating leaps of a Pavlova and her partner in the guise of whooping cranes. The last two performers were, however, captive and flightless in a natural environment of the Gulf Coast, a fact which it would have been more forthright of the narrator to tell.

"The importance of photography of such power is already disclosed in the history of the True-Life series. The first response of the uninitiated, which doubtless means the bulk of the theatre-going public, is huge amusement at the antics of wild birds never previously beheld. Then gradually, an appreciation of sheer beauty and wonder grows out of what had seemed only funny. And this leaven, this change, which is akin to true patriotism or to the love of one's fellow man, supple, more than all the struggles of conservation societies, the real hope that our descendants may still enjoy the lift of what Thoreau called 'the tonic of the wilderness'."

"The Royal Tour of Elizabeth and Philip"

"The Royal Tour of Elizabeth and Philip" brings to the screen a photographic record of the journey that many of our readers followed in the press and newscasts from November 1953 to May 1954. In seeing the natives of Fiji, Ceylon, New Zealand, Australia, and Africa, we are reminded of the diversity of cultures embraced by the British Commonwealth.



▲ THE "GOTHIC" was boarded at Suva by Fijian chiefs, who invited Queen Elizabeth to land

We are fortunate to have as our reviewer the well-known ethnologist Margaret Mead.

"The Royal Tour of Elizabeth and Philip," writes Dr. Mead, "includes a series of beautiful dance scenes, exceptionally well staged, though very brief. We see some spectacular scenes in Ceylon,

combining shots of old ruins and the pageantry of modern parliamentary life in the youngest dominion of the British Commonwealth.

"The Maori dances include a poi dance—the woman's dance with two small flax balls—with a series of rows of dances in the most intricate counterpoint. The whole produces a pattern as elaborate as the designs on the borders of old Maori robes and strangely like them. In both Maori and Australian aborigines, the spectator is conscious of the perfection of the costuming where once some heads would have been unkempt, some clothes torn or frayed; and and one senses that something from the old life has become—in these modern times when the dancers speak English and know how to do suns—part of the pageantry of a world society on a wider stage.

"The progress of the royal party itself is an extreme dignifying of the usual: where the Maori dance grows more intricate to meet the Crown, the Queen's gravely sweet greetings are part of studied simplicity.

"From this picture, memorable also in highlights of typical scenery, the spectator gets a brief vision of how spreading world ties need not produce deadly uniformity, but only the light rule of law within which native dances need not vanish altogether as they become something quite different."

Produced by J. Arthur Rank in England, the picture is released in this country by the Twentieth Century-Fox Film Corporation.

Brief comments on films previously reviewed

Documentary and Grade A

Annapurna
The ascent of the now-famous mountain

Beautiful and deeply moving film

Conquest of Everest
One of the greatest achievements in the history of exploration magnificently filmed

Stirring epic from on-the-spot material

Out of This World
The best color film on Tibet that has been made available to the public

Instructive, entertaining film, with some window dressing

Down the Alphabet

Elephant Walk
Life on a Ceylon tea plantation

Elephants and cast put on a good performance

Hell Below Zero
A sock-and-slug drama, laid in the Antarctic

Operations of a whale factory-ship vividly and accurately portrayed

The Naked Jungle
Story of a Brazilian plantation owner's efforts to get a wife and their struggle against the elements

An entertaining melodrama with some unnatural history. Not filmed on location

What the Experts Said

Hole has pointed out in its bulletin *Oceanus*, if the farmer didn't know how many cattle he had or where they were during eight months of the year, or if he were in the dark as to how many young each cow had and what diseases and enemies had to be contended with, the price of a steak might well be \$10 a pound.

The California Department of Fish and Game developed a new method of tagging tuna by tying a small plastic loop just behind the dorsal fin. But this necessitated bringing the fish into a boat and holding it tight in a wooden trough. This method could not be followed with large tuna, which weigh 700 pounds or more. Mr. Mather developed a way of tagging these large tunas with a small dart. The Woods Hole Oceanographic Institution offers a reward of one dollar to the fisherman returning a tag from one of these captured tunas and even promises to return the tag, having learned through experience that some persons are inclined to keep this sort of a memento as a souvenir, in spite of its value to science.

Mr. Mather has been working out of the Lerner Marine Laboratory at Bimini in the Bahamas.

Indian Music

The music sung and played by the Indians living deep in the rain forest surrounding the upper Amazon River can be heard in this country for the first time on recordings made by Dr. Harry Tschopik, Jr. of the American Museum's Scientific Staff. The twelve-inch, long-playing record, called "Indian Music of the Upper Amazon," was made for Folkways Records during a ten-month expedition Dr. Tschopik recently made. He describes the songs of the Shipibo and Conibo as the most restrained, controlled, and well organized music in that part of the world.

Jamaican Birds and Binoculars

Of the 200 different birds that can be seen in Jamaica, several species are not known outside the island. These include the beautiful Streamer-tail Hummingbird, the Jamaican Mango Hummingbird, the nectar-eating Orangequit or Feather-tongue, the Blue Mountain Vireo, the Sad Flycatcher, so named because of its mournful notes, and the Rufous-tailed Flycatcher, sometimes called the Big-head Tom Fool.

We are informed by the Jamaica News Bureau that the bird watcher who comes to Jamaica can buy a pair of 6 x 30 Hensoldt binoculars in one of the Island's "Free Port" shops for \$69.30, a little less than half the mainland price.

Thirty-two Thousand Moths

One of the world's finest collections of North American moths was recently



Please Help May-Ling

Whose father died in defense of freedom, Korea, 1953

For little May-Ling, the horrors of war have been followed by almost unbearable misery. With her mother and young sister, born after the father left for the front, she lives in a wretched, bomb-scarred hovel. Just seven years old, she already knows responsibility and takes care of her sister when her mother goes to work in the rice paddies. Food and fuel are scanty, and May-Ling worries.

She is a bright girl and wants so much to go to school. But the Korean winters are bitter cold and May-Ling needs a warm coat, good heavy shoes to keep out the snow, a dress or two and, perhaps, a blanket. And she *must* be given hope for the future.

Your help can send May-Ling to school, can make her a healthier child with a chance to smile. With your help, she can learn to become a useful citizen in the free world her father gave his life to save.

HOW YOU CAN HELP MAY-LING

You can help May-Ling or another needy child by a contribution in any amount, or by the Federation's CHILD SPONSORSHIP plan. For just \$10 a month, \$120 a year, SCF will send "your child" warm clothing, knitting yarn, yard goods, school supplies, and other needed items—delivered in your name in Austria, Finland, France, Western Germany, Greece, Italy, Lebanon, or Korea. A gift in any amount will help at least one child.

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given to the American Museum of Natural History by Rutgers University. It contains more than 32,000 specimens, of which 1171 are holotypes, or original specimens used to determine individual species. It is known as the J. B. Smith and G. D. Hulst Lepidoptera Collection.

Fishes are Noisy

Fifty-four out of 60 fishes studied at the University of Rhode Island's Narragansett Marine Laboratory produced sounds. The fact that the study was carried out by a research oceanographer by the name of Mrs. Marie Poland Fish is purely coincidental.

Mrs. Fish found that fishes make sounds voluntarily and with a purpose. They are used for communication (particularly in breeding), as an expression of fright, and in other ways. Twenty-seven of the fishes produced sounds either with an air bladder, which gave out a low guttural drumlike noise, or by rubbing one part of the body against another. Mrs. Fish has reported her observations in details in a bulletin of the Bingham Oceanographic Collection of the Peabody Museum of Natural History of Yale University.

Bats in the Basement

Recent information from a hibernation laboratory in the basement of Stinson Hall at Cornell University, indicates that when a bat goes into hibernation, its heart slows down from 180 beats a minute to only 2 or 3. Its temperature drops from about 100 to the 40-degree temperature of its environment. And the sex life of the hibernating bat is perhaps strangest of all. Mating takes place in the fall, but fertilization is delayed until spring. Meanwhile, the sperm are kept alive in the female's womb.

The "battery" at Cornell is being operated by Professor William A. Winsatt and his assistant, who hope that information on the glandular and nutritional aspects of bat life may prove useful in human studies. Bats have shown themselves to be extremely successful creatures, for whereas man has lived on earth no more than about a million years, bats of a sort are known to have existed more than 60 million years ago. An article on the many curious ways in which animals hibernate, incidentally, is scheduled for publication in NATURAL HISTORY Magazine early this winter.

Trans-Saharan Expedition Returns to American Museum

Using two specially constructed cars, Mr. Claude Bernheim and his family successfully completed a journey of 13,000 miles between Casablanca and Cairo and brought back to the American Museum more than 20,000 feet of color motion pictures and a collection of ethnological material. The collection includes



▲ A SEA ROBIN, most talkative fish in Narragansett Bay, clucks for the mike as it receives an electric shock from Mrs. Marie Poland Fish. On the bottom is a toadfish, loudest noise-maker. Its deep grunt can explode a World War II acoustic mine

weapons and handiercrafts of the Tuareg tribe, the nomadic people who were once famous for their exploits against France's Foreign Legion. Among the Tuaregs it is the men, instead of the women, who veil themselves.

The party included Mr. Bernheim's wife, Janine (the Director of the New York office of France's National Center of Scientific Research and the French Government's Atomic Energy Commission); his younger daughter Daniele, who took the motion pictures; his older daughter Miriam Conant; and his son-in-law Francis Conant. The Conants specialized in sound recordings and still pictures.

According to Mr. Bernheim, the expedition covered areas of the desert thought never before to have been traveled by an auto. After crossing the Sahara, the party continued through French Equatorial Africa, the Belgian Congo, Uganda, and Ethiopia.

NATURAL HISTORY Magazine for November will contain an article by Francis Conant on one of the most interesting areas visited by the expedition. The part of the Sahara now known as the Touat was transformed over 500 years ago into a garden spot by an elaborate irrigation system, Mr. Conant reports, and it became the center of a thriving Jewish community. In the same year that Columbus discovered America, Moslems are said to have wiped the settlement out and

raised a monument to the man who killed the last Jew. Mr. Conant's illustrated article will trace the story of this astonishing area insofar as it is known and tell of the efforts of the modern French government to revitalize the region.

U.S. Forest Service Reports Record Cut

The U.S. Forest Service, which unlike the National Park Service is permitted to sell timber on the lands over which it has jurisdiction, reports that more timber was cut on them during the year ending June 30, 1954, than in any previous year. The total receipts from the sale of the timber amounted to \$61,288,630. An additional million and a half may be credited to the Forest Service after settlement of the administration of certain lands in Oregon and Alaska. This year's income from the sale of timber was about \$9 million less than the previous year, but this reflects lower stumpage prices, rather than reduced cutting.

Correction

Attention is called to the fact that an error crept into a caption for the palm tree *Washingtonia felifera* in the May issue of NATURAL HISTORY. This plan is by no means our only native palm as was implied, for in the southeastern part of the United States, at least twelve other native palms are recognized.

UNITRON

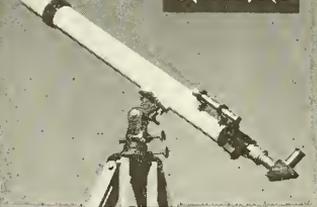
Did you see Mars?

This summer when the ruddy planet was the closest in years, owners of UNITRON Telescopes were able to see for themselves the polar caps and surface markings, so important in discussions of the possibility of life on Mars. The thrill of personal exploration of the vast reaches of space cannot be replaced by merely reading about the Universe. Observers never tire of studying the changing configuration of the moons of Jupiter, the rings of Saturn, the craters and mountains of the Moon, distant galaxies, and other celestial wonders.

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BOOKS

continued from page 294

and a considerable amount of privacy in the camping grounds.

The authors have prepared a two-part volume containing a concise introduction to the techniques of using the automobile as the medium for enjoyable camping trips and an extensive state-by-state tabulation of the location and facilities of campsites in the public park system. Basic information the fledgling camper should know concerning selection of equipment for the short and long haul and the operation of State and Federal Public campgrounds is presented in the first part. The experienced camper will find the second half of the book particularly valuable in planning excursions to unfamiliar areas.

The guide does not provide maps, the reader being referred to standard maps of the park areas. Where possible, however, route numbers and descriptions of site locations are given. While a very large number of sites are mentioned, this is

not, in the reviewer's opinion, an end in itself, but rather a tabulation of sites and addresses to permit the interested camper to obtain more detailed information from the park directly. A noteworthy feature in addition to rating of the facilities is the inclusion of park site areas in acres.

This book will be of particular interest to the beginning camper, who is unsure of himself in approaching an auto camping trip. Even after fifteen years of camping I welcome this book, for it will save a lot of time in scrounging around for addresses.

HARRY JONES

THE BOOK OF WILD PETS

----- by Clifford B. Moore

Charles T. Branford Co., \$5.95

A SECOND printing, published originally in 1937 and reviewed in NATURAL HISTORY Magazine by William H. Carr, December, 1937.

SHALL WE AUCTION

OLYMPIC PARK continued from page 320

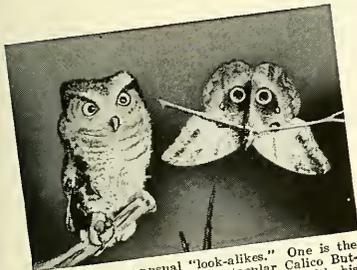
its later enlargement. Conservationists throughout the country were jubilant. Once again it had been proved that the economic motive is not the sole foundation of American ideology.

For the next few years no major outbreaks occurred on the Olympic front. But rumblings and minor skirmishes went on almost continuously behind the lines, and the issue was far from dead. Washington's Governor Langlie objected to President Truman's addition to the Park in January, 1953, and appointed his own committee to study the boundaries. As a countermove, the State's conservationists organized the Olympic Park Associates as a watchdog to warn of overt acts that might indicate a full-scale attack. Governor Langlie's committee brought out a divided verdict in March of this year. There were thirteen persons on the committee. Eight of them issued a majority report one sentence long, recommending further federal study. The remaining five members urged preservation of the Park's present boundaries in a fourteen-section declaration of arguments. Thus the long-

standing controversy came to a stalemate; but another battle for Olympus is inevitable.

You will probably never pick up your newspaper and read that the art dealers of Washington, D. C., are demanding the collections of the National Gallery, but sooner or later you will probably run across an insignificant item on page nine or ten, stating that the Washington State lumbermen have introduced a bill in Congress saying that it is in the public interest to let them log a couple of hundred thousand acres of Olympic National Park. If you do, remember that this is your property. Don't wait. Start shooting. Write to your congressman and senators. Wire Secretary of the Interior McKay and President Eisenhower. Join one of the many conservation organizations that so doggedly fights these battles for us. The National Parks are among our finest examples of practical democracy. They are thoroughly American institutions and deserve our unqualified support. Fighting for their preservation is true patriotism. So let us give a final and unmistakable warning to private interests and ambitious government bureaus that seek to destroy them—HANDS OFF OUR NATIONAL PARKS!

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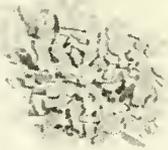
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Natural History

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With the exception of the llama, at right, the originals of all objects illustrated are in the collections of the American Museum of Natural History.



PRE-COLUMBIAN GOLD

Silver:

MAN RIDING THE LLAMA. The silver original of this rare figure is in the United States National Museum and came from Cuzco, Peru. It dates from about 1200-1532 A.D. The Incas showed great skill as metalsmiths. Silver llama riders are not uncommon, but one with a rider is. The fact that this rider is a hunchback makes it all the more unusual. Hunchbacks were frequently singled out and given ceremonial significance. The reproduction has triple silver plating and stands 4" high. \$7.75 postpaid.



AFRICAN HORNED MASK

The original of this multicolored wooden mask was carved by the Senofo people of the Ivory Coast in Africa. The reproduction is remarkably successful in capturing the grain and character of the wood. The grayish brown tone is enlivened by red scarification marks and by painted white decoration. The mask is 14 1/4" high overall. A well-executed example of 19th century African art, ready to hang and to dramatize office, den, library or living room. \$15.50, express collect.

BASCHILELE CUP

The Baschilele inhabit the Kasai area deep in the Belgian Congo and are best known for their carved wooden cups. They are closely related to the neighboring Bakuba, a tribe whose art evidenced love of form, knowledge of materials, technical refinement and sophistication. This cup, which originally had a handle, is 5 3/8" high; its interlocking geometric pattern is related to tribal textile designs, and the whole is of a dark walnut color with glowing mahogany undertones. The slightly irregular, obviously handmade character enhances its interest. Fitted with double metal liners, it is highly distinctive and decorative used alone, or for flower arrangements. \$6.95 postpaid.

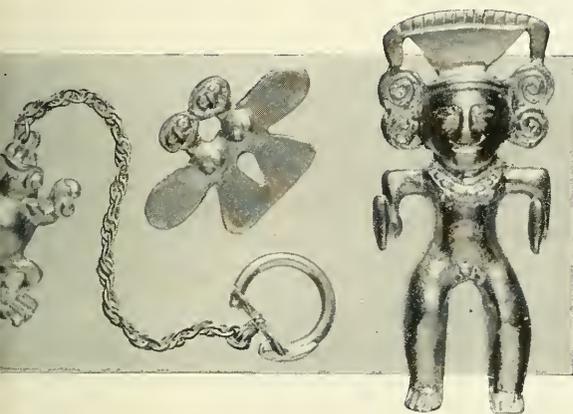


HAIDA INDIAN TOTEM POLE

The Haida Indians of the Queen Charlotte Islands used a rare type of slate in carving some of the handsomest totem poles known. The Northwest Coast Indians polished their slate carvings with shark fins and then rubbed them with oil to darken the slate. The space-filling and interlocking designs in this unusual rectilinear totem pole are pleasing, and the carving is admirably executed. The inset discs are of pearl shell. Standing 19 1/4" high, it makes an important ornament in any setting.

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Gold:

FROG, the double BIRD, and the FIGURINE were found in a grave in Costa Rica, and date from the 14th century. They were cast in solid gold by the lost wax process. The Frog and Bird are probably the work of the Aztec Indians, while the Figurine is a style native to Veraguas, Panama. Reproduced in actual size, these reproductions are available in various forms in solid gold plate. They make highly attractive gifts for both men and women at very attractive prices."

Prices:

PINS, with safety clasp: Figurine, \$5.75.
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TIE CLASP: Frog, \$2.90.

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DROP EARRINGS: Frog or Bird, \$5.50
pair.

CLIP EARRINGS: Frog, \$5.50 pair.

*All prices are postpaid,
including tax.*

BATEKE FETISH FIGURE

Bateke live in the Congo region of southern French Equatorial Africa. Their best-known works are medicine statues carved from wood. These are generally characterized by erect figures, large heads, short, bent legs, beards resembling those worn by the tribal elders, and a stylized hairdo shaped like a horn or crested helmet. This fine example, at right, is fairly representative. It is especially entertaining in its cubistic angularity and unusually picturesque silhouette. Reproduced with great success in Alvastone and standing 12" high, it is guaranteed to monopolize conversation in any company. One of the most arresting African figures available in reproduction.

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Photo by Don Knight

▲ Morro Rock, the Gibraltar of the Pacific, is framed in the late evening sun by a native California Cypress tree in Morro Bay, California. It is 576 feet high

LETTERS

Sleeping Leaves

SIRS:

Here is a question I would appreciate very much having you answer in your Letters Section: Why do the leaves of many of the legumes close at night and open with the return of daylight?

D. T. FLEMING

Maui, Territory of Hawaii

The following comments are offered by Dr. Harold N. Moldenke, a well-known botanist, who is Director of the Trailside Museum on the Watchung Reservation in New Jersey:

These so-called nyctotropic or "sleep" movements of plants are best known, of course, among the legumes, but plants of other, often quite unrelated groups also exhibit them. Charles Darwin, in his classic work on the power of movement in plants, found 37 genera in which the leaves or their leaflets rise at night and 32 genera in which they sink.

Modern plant physiologists are reluctant to ascribe any definite functional value to these movements, preferring to say that they simply may be the reaction to changes in light, temperature, or moisture. In other words, the movements

could conceivably occur without having any significance to the plant. On the other hand, Darwin expressed the opinion that they are in some manner of high importance to the plant. It was his belief that by pressing the upper surfaces of the leaves or leaflets together at night, the plant cuts down on the loss of heat from the upper surface through radiation, much as loss of water by transpiration is reduced if the leaves assume a vertical position at mid-day, as they do in certain plants. Another advantage that has been seen, particularly in plants belonging to the *Mimosa* group, is that the

continued on page 381

NATURAL HISTORY

The Magazine of the American Museum of Natural History

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October, 1954
Volume LXIII, No. 8

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MAN AGAINST NATURE

----- Edited by Charles Neider
Harper and Brothers, \$5.00
483 pp.

THIS is the best collection of tales of adventure and exploration ever assembled in a single volume.

Peary, Amundsen, Hillary, Wright, Heyerdahl, Lindbergh, Beebe, Shackleton, Scott, Groeley, Dana, Cousteau, Hemmingway, Schweitzer, and Herzog are some of the men who have contributed to this most unusual work. Taken together their writings make an impressive history of man's efforts to conquer nature in her many moods. Man's character is revealed as brilliant, brave, and curious almost beyond belief.

Byrd's isolation in the Antarctic holds a peculiar fascination, which is, perhaps, best appraised by Herzog when he writes of man's deep thirst for knowledge. Less well known are gripping stories such as the strange death of Louis Slotin who juggled the guts of an atomic bomb, or Broomfield's experiences in wildest New Guinea. Indeed, nowhere in the annals of recent exploration, is there a more wicked tale than Broomfield's, who by all odds should not have survived to tell it.

There are 47 excellent contributions. It is wonderfully refreshing to relive the victory that was Amundsen's, the sorrow that was Scott's, to travel with Peary to the other pole, and to dive with Cousteau into the new niche, which he has made accessible to man. Spine tingling and choking is the story of his closest brush with death while wandering like an aquatic ghost in the innards of a French cave.

The reader bails out at supersonic speed with one who did, and having flown faster than sound, goes to a rocket shoot to learn much regarding the imminent realization of man's dream to conquer interplanetary space. He is shocked to discover the prevalence of rogue rockets.

Eric tales designed to make one's skin crawl are included. The diary of a criminal long ago marooned on Ascension Island packs the fearsome wallop that Giovanni Boccaccio achieved in his account of the great plague of 1348.

Of Hemmingway, Lindbergh, and Beebe, one can only hope that the first man to view a Martian landscape will be endowed with their literary gifts.

E. T. C.

SONGBIRDS OF AMERICA

----- by Arthur A. Allen
and Peter P. Kellogg
Book Records, Inc., \$4.95

PROFESSORS Arthur A. Allen and Peter P. Kellogg of Cornell University are well known as pioneers in the recording of the songs of birds, frogs, and other animals. Now, on a single long-playing record (available either in 33 $\frac{1}{3}$ or 45 RPM) they have brought together the songs of 24 colorful American songbirds. Most of the renowned singers are here: The Wood Thrush, the Mockingbird, the Fox Sparrow, and the Bobolink. With the record one receives a spiral bound album of 30 pages containing an account of each of these birds, its habits and how to identify it. Identification is made easy by splendid color photographs, the work of Professor Allen. There are also short general accounts of the nesting habits of birds, their migrations, and how to attract them to one's lawn or garden. All in all, this combination of songs, pictures, and text makes an excellent introduction to the pleasures of bird study.

DEAN AMADON

THE MAMMAL GUIDE

----- by Ralph S. Palmer
Doubleday and Co., \$4.95
384 pp., 250 figs. in color,
numerous line drawings and maps

THIS guide to the mammals of North America north of Mexico is a companion volume to the Audubon Bird Guide and other similar nature guides published by Doubleday. It is a compact, pocket-size book with a concise text, with good illustrations.

This book has its greatest usefulness as a field manual and reference for identification wherever mammals are encountered. The treatment is by the larger natural groups in their systematic sequence, and the text is written for the layman. Having described the Western Chipmunks, for example, the author then briefly summarizes pertinent data on some of the more outstanding species within this highly variable group. No attempt is made to list the full number of species and subspecies recorded from the area covered by the book. Since this figure is of the order of two thousand or more, it may be argued that this present restricted treatment is more useful for

most persons wanting to know our mammals better.

The data are organized under such heads as habitat, reproduction, habits, and economic status. A small map shows where the mammal occurs. There are frequent black and white sketches of tracks and details that are not easily brought out in the color plates.

The color plates, 40 in number and showing 250 figures, are good. For a book in this price range they are very good, but it must be admitted that sometimes the registration is off somewhat and color values call for a little charity in interpretation. But the artist has been exceptionally understanding of his subject, he has caught the essential character, and the net result is very pleasing.

It would help the reader if a few more titles for reference were given. After all, this book will often be just the introduction, and the reader will wish to go farther.

HAROLD E. ANTHONY

WESTWARD HO WITH THE ALBATROSS

----- by Hans Pettersen
E. P. Dutton, \$4.00
218 pp., 28 plates, 12 charts

THIS ACCOUNT of a recent Swedish circumnavigation of the earth offers a popular record of new and important oceanographic research. Its author is one of the foremost authorities in his field.

The book is a fine reflection of purposeful national pride. A substantial training-ship, the four-masted power schooner "Albatross" was borrowed from a Swedish shipping corporation and was temporarily converted and outfitted for research, largely with funds contributed by Swedish industry. The scientific gear was of advanced type, particularly with reference to apparatus capable of obtaining cores from bottom deposits lying under the most profound depths of the sea. This type of sampling had been begun as long ago as 1872, when the famous "Challenger" was able to sink tubular collecting cylinders to a depth of a mere one or two feet. Half a century later the German "Meteor" lengthened such cores to about one meter. Shortly before the Second World War, Dr. C. S. Piggot, of the Carnegie Institution of Washington, invented a kind of mortar-sampler, which employed explosives, and succeeded in

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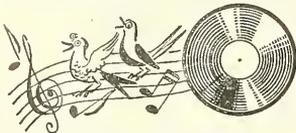
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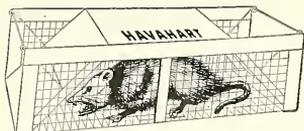
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Perhaps the most entertaining part of Dr. Petterson's narrative is the whimsical chapter entitled "An African Interlude," in which he recounts his overland journey from Port Sudan and down the Nile. By and large, however, the book is of greatest value as a simple exposition of exciting and somewhat abstruse modern scientific methods. R.C.M.

PATTERN OF THE TIGER

----- by Stanwell Fletcher
Little, Brown and Co., \$5.00, 296 pp.

THE author of this book lived in India in his earlier years and then, in 1951, returned as an American naturalist to investigate the practicability of an expedition to collect mammals. He also was interested in seeing firsthand what political and economic changes had taken place since his former residence. The pattern of the narrative therefore is a central core of natural history wrapped up in a substantial covering of what might be classified as current news reports on India and Pakistan. Both faunal data and discussion of man's activities are interesting, but the book contributes more as a commentary on the India of today.

Fletcher had his previous residence in India to prepare him for getting about with a minimum of red tape and delay, but nonetheless he frequently encounter-

ed futility and frustration. Some of this was due to the suspicion he was a spy operating behind the ostensible activities of a naturalist. The reader may perhaps, at times, also conclude that the faunal venter is a little on the thin side. The text, devoted to the naturalist's vernacular, is in character as far as it goes, but Fletcher was only sampling. His identifications are in general terms, and probably that is sufficient for the lay reader. But to the collecting fraternity this survey of natural history possibilities has a "once over lightly" aspect.

Fletcher's analysis of the Indian situation will doubtless meet with criticism. This reviewer found himself in agreement with most of the opinions expressed. A great deal of light is shed on the tense situation with India vis-a-vis Pakistan, and this latter political unit has a staunch champion in Fletcher. In these days of troubled world politics, a book such as the "Pattern of the Tiger" might be typed as required reading for the well-informed man. Whether he agrees entirely with the author is somewhat besides the point. The book discloses the explosive situation which exists.

HAROLD E. ANTHONY

MY LIFE IN THE MAINE WOODS

----- by Annette Jackson

W. W. Norton and Co., Inc., \$3.50
236 pp.

THIS is a restful story of life in the wilderness beyond the reach of civilization, of solitude and silence so profound that one could hear a mouse snore.

Annette Jackson entered the Maine woods as a warden's wife with a sincere desire and determination to become a part of this land of lakes and forests, and she made good her intentions. Often alone in her cabin for days and nights at a time, she overcame her feeling of lone-

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liness but never quite lost her fear of bears. Every spring these meddlesome creatures left their dens, and as often as not one of them would raid her store of provisions.

Annette Jackson made a warm, happy home in the wilderness and raised four children. Starting from scratch, she became accomplished at hunting and fishing, learned to tie her own flies, and canned and preserved a regular supply of meat and berries.

Above all, she loved to accompany her husband on his tours of inspection, regardless of the season of the year or conditions of the weather. She writes, "I still don't know which I prefer, summer with his fishing and camping . . . or winter when after a trip through the snow with the children and dog sled our little cabin was the coziest place in the world. I do know that I loved the days when the blizzards came and if you looked out of the window you could see nothing but drifting snow for miles . . . there was no use in looking at the clock during a blizzard for then time means nothing. In the wilderness, in an odd way, this sense of timelessness occurs at other times throughout the year."

This book is the high lights of the day-by-day life of Annette Jackson through the changing seasons of the year and is told with simple eloquence and charm. **GEORGE C. GOODWIN**

WILD FLOWERS AND HOW TO GROW THEM

-----by Edwin F. Steffek

Crown Publishers, \$3.95
192 pp., 100 illus. (50 in full color)

THE title of this book may lead a conservationist to believe that it will encourage plundering the public domain to enrich private gardens. On the contrary, the author urges realistic conservation, and his book is sponsored by the American Nature Association and the Wild Flower Preservation Society, Inc. He believes in teaching people to know and appreciate wild flowers, to learn which ones may be brought into private gardens without jeopardizing the public supply, and which ones will survive a move from their native environment. He explains whether the collecting requires entire plants or may involve only a few seeds from an overabundant supply, and he outlines the conditions required for the thrifty growth of the transplant. Anyone reading this book and practicing the philosophy of the author will believe in the wise and considered use of this natural resource, which does not imperil its existence; he will resent any destructive and wasteful inroads upon the wild supply, which leaves it the worse for the experience.

The forepart of the book discusses in broad terms the author's analysis of conservation as applied to wild flowers and outlines the fundamental considerations that should govern the attempt to grow them. These are practical comments, and their application will have considerable bearing on the success of the operation.

Tables tell where to find the various wild flowers, which ones may be picked, and where in the scale of soil acidity certain species are happiest.

The second and largest part of the book describes more than 350 species of wild flowers, tells where they grow, and gives blooming season and culture.

The many half tone illustrations are useful and the color plates are exceptionally good for a book in this price range. They are reproduced from paintings by Mary Vaux Walcott and used in *Wild Flowers of America*. Most have good color value, but it must be admitted there is occasionally poor registration. On balance, they are very pleasing and will be very helpful in identification.

HAROLD E. ANTHONY

SNOW CRYSTALS

-----by Ukichiro Nakaya

Harvard Univ. Press, \$10.00
510 pp., 200 drawings and diagrams,
1550 photos.

ALTHOUGH the layman will not find the text of this book very palatable for his casual reading, he will find the pictures worth his inspection.

Professor Nakaya has made the study of ice and snow crystals the subject of twenty years of research. Aside from a few general conclusions, we do not learn very much here, but this is not said in criticism of the work. The book is wholly admirable, but it shows that there is just too much variation in Nature to be explained simply.

F. H. PUGH

SEA-BIRDS. AN INTRODUCTION TO THE NATURAL HISTORY OF THE SEA-BIRDS OF THE NORTH ATLANTIC

by James Fisher and R. M. Lockley
Houghton Mifflin, \$6.00
320 pp., 68 photos, 66 figs.

ALTHOUGH focused particularly on the avifauna of the most-traveled ocean, this book is an indispensable general introduction to its subject. The unparalleled field experience of the two British authors makes them the ideal team to produce such a work.

The first seven chapters supply a fundamental understanding of the geography of the North Atlantic, the probable

continued on page 383



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▲ EXAMINING a typical redeap hair-do of the tribe. It is made by plastering the hair with the red paste of the achiote pod. The treated hair feels crisp to the touch and will last for days if not exposed to the rain. All the men wear this hair-do, as well as covering the whole body with the paste

The Scarlet Indians

They are threatened with extinction unless they accept white man's medicine, as well as his diseases and trinkets

By VICTOR and GRACE KINGMAN

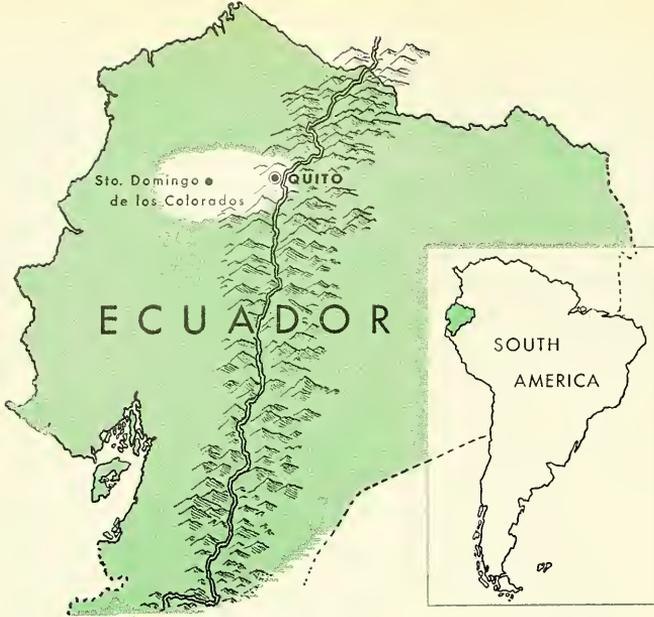
Photographs by the authors

WE were in the highland city of Quito on our way home from a round-the-world trip when we decided to try to see the bright red Colorado Indians while they were still living under natural conditions. Deep in the Esmeraldas jungles of Ecuador, as far from civilization as they can get, the last members of this tribe are making a desperate stand at survival.

The Spaniards called them "Los Colorados," The Red Ones, because of their lavish use of red coloring for body decoration. Their own name is Tsátchela (pronounced ZAG-sila). Many tribes of Indians throughout tropical South America

◀ TORIBIO AGUAVIL, nephew of the chief of the tribe, grinds maize with a rough-hewn mortar and pestle. The "sarongs" worn by the members of the tribe are handloomed by the men. Occasionally, younger ones acquire store clothes by bartering achiote seeds in the markets of Santo Domingo de los Colorados





use the red paste of the jungle achiote tree for adorning themselves, but the Colorados carry it to the extreme. They work the scarlet grease into their bowl-cut hair to form a shining helmet and color their bodies with it from top to toe.

The Colorados have diminished from about 5000 at the turn of the century to less than 500 today. The Ecuadorian Institute of Anthropology, fearing that the tribe may become extinct unless guarded from the sicknesses of civilization, has asked its Government to set

aside 12,000 acres between the rivers of Peripa and Baba in the lowlands of Santo Domingo as a Tsáchela Indian Reservation. Even if the Ecuadorians are successful in protecting them, the Colorados will not be the same on a reservation, and we were anxious to see them as they are now.

An all-weather road had been finished since the war for bringing bananas from sea level at Santo Domingo over the Andes to Quito. We faced the wet season of May, 1953, and torrential rains had inundated the city of Guayaquil. Landslides were reported in the Andes, and one-way traffic was enforced on the banana route. But early one morning in Quito's market, we picked a truck bearing the name MAC HAR TUR and started.

It is difficult to trace the history of the Colorados. Since early historical times they seem to have been in flight from what we call progress. About 100 years after the Spanish conquest, a Jesuit priest reported finding a group of this description closer to the coast than their present homeland, but it seems more likely that they came

▼ THE TRUCK that took the Kingmans from Quito, Ecuador, up over the Andes and down into the lowlands. Note the insignia MAC HAR TUR, which it carried for good luck. This new road takes passengers to heretofore inaccessible places



▼ A PINEAPPLE MERCHANT of "Los Colorados," who will trade his wares for red achiote seeds. With these, in turn, he will barter for "store" merchandise

from the Ecuadorian highlands. About a century before Pizarro's conquest of South America, they fled from the warring Incas. The Inca Pachacutec had extended his empire from Argentina to Ecuador, and the Colorados took to their heels rather than accept Inca culture. Later, in the sixteenth century, they escaped subjugation and possible annihilation by Spanish conquerors by trekking over the western cordilleras of the Andes into Santo Domingo.

Our road wound upward always in sight of the great volcanoes. Chimborazo, the giant, 20,577 feet above sea level, poked her white cap through cotton clouds as we neared the pass; and we recalled that the giant of liberators, Simon Bolivar, had crossed the Andes near here, from Venezuela, with his half-starved, ragged, frost-bitten battalion, to free Quito and Peru from Spain. At the base of that same mountain had stood another man of history, three centuries before Bolivar—Ruiminahui, the last of the Inca chieftains. It was there that he fell before the Spanish hordes, with his countless braves. Coto-

paxi chose that occasion to erupt and heaved forth rocks at the invaders with great gusto but without effect.

We reached the 12,000-foot pass in one hour, and our driver pointed across the road into space. "Latitude zero," he informed us.

We were on the equator and shivering.

Descending the narrow, twisting road, we dropped swiftly to subtropical climate, leaving stunted growth and wind-swept mountains for lush green. White orchids appeared in profusion, and large blue butterflies. Tall slender trees with pale bark were studded thickly with the various epiphytes of the jungle and were matted with lianas whose long cords laced them to the neighboring growth.

We hugged the cliffs while waterfalls dashed down and washed gulleys across our path. Far below, the swollen Rio Blanco twisted its way.

Our first real difficulty came when some banana trucks, having somehow missed the traffic control below, came up the road. Being loaded, they claimed the inside, and with much uneasy seesawing, we

passed them at the cliff's edge.

"Landslide!" shouted our driver.

We could see falling rocks and huge chunks of earth fast blocking the narrow road ahead as he pulled the brakes for a sudden stop.

"It will take hours to clear the road, and we must wait for the road gang."

When the road gang arrived hours later, it operated at only "half capacity." There were eight Indians with four shovels.

More landslides, and a truck lying crushed on its side several thousand feet below in the river, told a story we did not like to think about.

Toward evening we arrived and were given accommodations at the Astoria Hotel in Santo Domingo de los Colorados. There were 30 rooms, all upstairs and of course without running water. We improvised, placing a washbasin on the floor and splashing about bird style. A loud knock and angry shouting warned us that we were drenching the barber's customers below. The floor was a sieve.

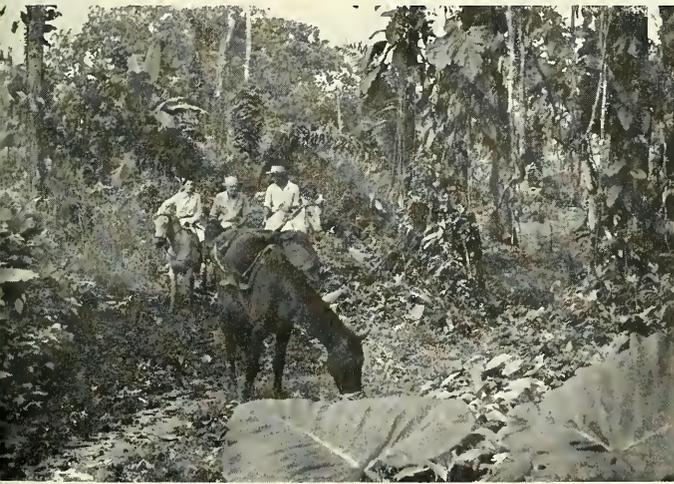
Room and board here cost only \$2.00 a day, and bananas a foot long, ripe from the trees, were 5¢ a dozen. Clothing suitable for the mosquito-infested jungles — long-sleeved shirt, trousers, belt, and cap cost \$6.00. Customers were rare in the Santo Domingo shops, because the population was only 500, not counting the Colorados, who had moved 15 miles or more back into the forests.

It was therefore startling to see a bright red figure on horseback streak past us through an aura of dust. Perhaps there were others in town.

On the steps of a shop, a Tsátchela woman was nursing her baby. We photographed her and offered colored soap, which she took and smelled but did not acknowledge by any change in her stolid expression. She had painted a black veil across her face, which we thought at first was tattooing, and her hands and feet were also painted black.

Inside the shop, her husband was trading a bundle of dried red

▼ BEYOND Santo Domingo de los Colorados, the jungle trails were deep in mud. Irene Wuth from Quito is seen at left, beside Mr. Kingman and Vicente, a friend of the Colorado chief. They are looking for a group of the "Red Ones" who fled into the swampland to escape civilization





▲ A LITTLE LADY of the Colorados tribe, content with the addition of a broken flash bulb to her necklace of tapir teeth and seeds

berries. The red-helmet hair-do marked him immediately as a Colorado. He was of good size, perhaps five feet, nine inches. His legs were stocky, his toes widespread. He wore a short wrap-around of hand-loomed black-and-white cotton tied with a red belt. His body was smeared with red lined with black stripes, and a turquoise neck scarf accented the effect.

We were in for a shock when he turned to stare at us. Surely he wasn't a *real* Colorado. An initiate from a college fraternity or a member of the "Maskers" but not an Indian! His eyes were light blue, and pale skin showed beneath the red body paint, though his cheekbones were prominent and his face rather wide and square.

A savage look came into the red one's eyes when he saw our cameras. He grabbed his package of achiote and ran swiftly down the dusty road. We started in pursuit, but he outdistanced us. His wife followed unhurriedly, baby swinging at her back.

Among the San Blas Indians of Panama, who happen also to speak a Chibchan dialect, there is a high percentage of albinism, and we inquired if this could be the case with the Tsátchelas.

"There is only one albino anyone ever heard of among the Colorados," Vicente the muleteer told us, "a woman who ran away from her husband and married a Turk near the coast."

"Why did she run away?"

"Her husband had gotten her sight unseen from her father and thought that she was a witch. He would stay away all day in his corn patch. At night, she would loom up out of the dark like a light, and he'd run off again. She finally disappeared and turned up later with the Turk."

Vicente supplied us with the jungle breed of skinny little horses for the trail. A colt that tagged along had to be repeatedly pulled out of the mud. Leaving the dilapidated town of Santo Domingo, we passed a few houses on stilts and met the real jungle.

Heavy rains the night before had turned the narrow path into slush as deep as our horse's knees. We had to rein them around the sink-holes zig-zag fashion, which practically doubled our mileage.

About five miles out, a spot of scarlet broke the monotony of the green ahead, and from behind a rotted log we watched an entire parade of the red-helmeted red-besmeared men of the Tsátchelas stride by. They literally glowed beneath their scarlet hair, appearing too healthy for members of a dying tribe. Bright ponchos of "store" material hung gracefully across their broad red shoulders, and their narrow hips were covered with black-and-white hand-loomed cotton. Wide silver bracelets on both wrists gave the Colorados further elegance.

Women and children followed, as unreal a group as movie extras on location.

The women wore no red. Their skin looked white, and contrasted further with their long black hair and stripes across their faces. Some of the younger ones had highlighted each breast with a circle of black dashes. Later we saw a pair of

young matrons squatting by the path, painting each others' fronts.

The teeth of some of the Colorados were stained black from the bark of a certain tree, and we later saw them transfer the pigment to their skin with a feather brush.

One small boy, with streaks of red hairdressing coursing down his face, had painted a black airplane across his chest, and another had painted on a crucifix.

We learned while staying with the Colorados that red achiote paste is not waterproof and that the hair-dos must be renewed after each rain.

We stopped our horses at San Miguel and found that the small church was no longer maintained by the Colorados as it was when W. E. Stevenson was there in the last century. Only occasionally were services sought to legalize mar-

riages. Stevenson described the Tsátchelas as wearing short white "drawers" and white ponchos when he visited them. "Their hair is cut round and hangs like a mop," he wrote, "confined to the head with a fillet of silver lace." O her changes came as the Colorados fled deeper into the forests.

We found the town of San Miguel in ruins. The trail divided at this point. We took the slushier one to the left. If we had thought the going bad before, this last stretch to the homes of the Colorados called for new adjectives. Our horses fell to their knees down the slippery incline toward the river.

Vicente finally called a hal. At the small clearing, in which stood a large wooden shelter. The framework was of poles and the sides split bamboo; the roof was thatched with dried banana leaves. It was



◀ ON THE "FRONT PORCH" of their primitive home in the jungle. The boy is tinted red to the roots of his hair and striped with black stain. His little sister will in time paint on a "veil" and fancy doodads on her chest

▲ A MARIMBA they made of cane and strips of ironwood, copied from an original on the Esmeraldas coast of Ecuador. The nephew of the chief is explaining in halting Spanish that it is played by the men during the puberty ceremony

about 30 feet square and joined a roofed-over area of about the same size.

"The house of Ramon, the chief," stated Vicente.

The one smeared with achiote, however, was a nephew. Ramon had lately moved farther into the jungle, he told Vicente in a Chibchan-Spanish jargon. Toribio Aguavil, with his family and a few other relatives, had fallen heir to the chief's home. Vicente asked if we could stay a few days, and he became silent.

We had expected the "Como no?" ("Why not?") of the Spanish, but the red one stepped into his house and left us standing in a sudden downpour of rain.

There was nothing to do but unpack quickly and put our provisions and bedding under thatch that didn't leak.

Red helmets poked out from the bamboo door, three in perfect shape and six little ones not so perfect. Females of the species came out—women minus their painted-on "veils" and small girls with uncombed hair. There were no smiles of greeting.

We passed out round mirrors that had a dancing ball game on the back. The women took them solemnly, shook them, and disappeared inside. One of the men took a very large mirror from the back of his "sarong" and looked disdainfully at our small ones.

"Have a cigarette?" we asked in careful Spanish.

Yes, he would.

We distributed candy among the girls, which they took as daintily as squirrels in their black-stained hands and ran quickly inside. They must have cached it somewhere, for in a moment they reappeared, looking at us with bright, dark eyes but never asking for more.

After an hour or more of such thawing, we sat around in a circle and looked at one another.

"You needn't lock anything up," Vicente told us. "These Colorados don't steal like the Jivaros."

A group of the head-hunting Jivaros lived in the mountains near

by, but we had been assured that they were only interested in collecting and shrinking the heads of other Jivaros.

A marimba of cane tubes, which Toribio had copied from an original coastal model, swung from the eaves, and we used it as a serving table, out of reach of pigs, chickens, and dogs.

Inside the house a fire was kept burning, flickering through the bamboo slats like an old-fashioned lantern in the night. We could see easily into the large room, where the adults moved about with flares, chain-smoking our gift cigarettes.

Their beds were of split balsa wood, fastened to the wall with wooden pegs about three feet from the ground and supported by poles at the corners.

Undemonstrative

At no time did the Tsátchelas raise their voices in anger or joy. Children were corrected quietly, if at all. Exuberance was reserved for feast days, we were told, when all red bedlam breaks loose.

A large black pot hung over the coals, and Toribio pulled the logs apart to conserve the fire, which was never allowed to go out.

Cooked plantains were the mainstay of the Tsátchela diet, and the people ate only one meal a day, toward evening. We always felt guilty eating boiled eggs and drinking coffee in the morning with a circle of children looking on.

Inside we could see men and women sitting around a huge pile of achiote pods, popping them much as we shell peas and scooping out the red berries inside to fill a large basket. It made a nice domestic scene. The coloring was used by the colonists in earlier days for tinting soups and other foods. The plant was later cultivated in quantity so the coloring could be shipped to France and England for use in tinting oleomargarine. Although reputedly tasteless and odorless, we found that the berries had a noticeable vanilla fragrance. The popping noise continued, and so did a strange sound out in the

jungles like *psst, psst*, until we finally dropped off to sleep on the hard ground.

Long before dawn, we were awakened by a low growl and heard the baying of a dog. On the other side of the bamboo slats, we could see Toribio trying to quiet a bony beast that was staked in the corner as a watchdog. He spoke softly to it, with no effect whatsoever. The howling came out crescendo.

Loosened, the animal burst through the door like a thing possessed, straight for our frail mosquito-net enclosure. We shouted, and the dog went ki-yiing off into the jungles, his yelps blending with the *psst, psst*.

Toribio thrust a flare in our faces and informed us, "The dog keeps a demon."

Like many aborigines, the Tsátchelas believe all nature to be animated by good and evil spirits. Illness is attributed to demons wishing to do them harm, and the people set out at once with their sick in the direction of the tribal shaman. Doctors are unknown here.

Alexander, the shaman, lives north of Santo Domingo across the river and does not permit patients to cross to his side. A psychologist by nature, as was his father before him, Alexander waits until about midnight to ford the river to the ailing Indians, his way lighted with torches held aloft by his servants. He brings food and first feeds the famished ones.

Many arise and leave at once, believing they are cured. Stubborn cases must undergo the "spine treatment." Medicine man and patient first take a narcotic brew made of a native vine. When both are thoroughly stupefied, the shaman shows the sick Indian a thorn he claims to have magically removed from the patient's spine, along with the curse which put it there.

Outside San Miguel stands a large tree where the Colorados once put the ashes of their dead and built miniature shrines to house their souls. Now they bury them either beneath small shelters at the edge of the clearing or under their



▲ THE COLORADOS are exceptionally fond of bathing in a near-by river. The little boy keeps his hair out of water so the red won't come off



▲ PICKING ACHIOTE PODS from the tree. When a young man of the tribe is about twelve, he combs his hair into the red helmet worn by a mature man



▲ SCOOPING UP HANDFULS of the red berries from the drying rack, the boys showed how the greasy coloring matter is worked into the hair



➤ INSIDE A TYPICAL HOME of the Colorados. Shelves fastened to the wall were used as beds. A fire for cooking was kept burning all the time. The one-room house was regularly swept with twigs. The adults spoke softly to the children, who were always well behaved

houses. A string may be tied from the neck of the dead person to the eaves, by which, during a period of "taboo," the soul is believed to escape.

Ceremonies for a Colorado boy's coming of age are most fantastic and until recently were compulsory. The rites are called *kimfulse*, and when questioned regarding them, a Tsátchela's only answer is a burst of laughter. The initiate is given the local narcotic, and his nose is pierced by a chonta palm thorn. The boy is directed to enlarge the hole by pulling on a string, which has been threaded through it. A wooden plug is fitted in, and later a large silver pin with "new moon" crescent may dangle festively from the nose.

Friends participate in *kimfulse* by joining hands in a circle and dancing and chanting to marimba music. They pause only to drink chicha (corn brew) from a large wooden trough. If some pass out, their places are taken by those who have recovered.

At present, the average age for marriage is about sixteen for a girl and eighteen for a boy, arrangements having been made between the parents, with a corn patch or cow closing the deal. The Tsátchelas are monogamous. Infant mortality is high, and we were told that there had been a majority of male births, all of which accentuates the danger of tribal decline.

We were teaching the children to play ring-around-a-rosy, but when we asked Toribio to play the marimba, he laughingly refused.

"No *kimfulse*," he said.

We began to teach them tick-tacktoe instead.

Late one afternoon, two of the Tsátchelas prepared to hunt. Old muzzle-loaders dating perhaps from Spanish occupation were taken down from the rafters and carefully cleaned. A bottle of chicha was placed between the men, and they began to drink in a serious way.

"Snakes won't bite when they smell chicha," Vicente told us. "The deadly fer-de-lance crawls all over the Colorados without biting."

At sundown, six o'clock on the equator, our host and his wife returned from the forest, instead of the two men who had left so well "loaded." They were walking erectly under heavy burdens. One carried a dead tapir and the other a huge bunch of bananas. A small tapir such as Toribio had shot is greatly relished by the Tsátchelas, and we found that it tasted much like our barbecued pork.

One day, the bamboo door was left ajar, so we entered. A girl had swept the dirt floor with twigs and was now feeding a naked baby with cooked bananas. We helped the women shell achiote for awhile, noting the clean, earthy smell mixed with a definite vanilla scent. Achiote has altered the economy of the Colorados since the coming of the white man over the ridge with luxuries such as bright combs, mirrors, and beads. They now pamper this native tree, guarding its berries like money, for they will bring things in trade that they have never had before. But authorities say that unless these red-capped Indians avail themselves likewise of white man's remedies, they are doomed to succumb to his diseases.

Coiffure

Two small boys with smears of red through their hair offered to show us how the red helmets were made. They took us to the drying racks outside, removed a roof of thatch which protected the berries from the night's moisture, and began scooping up handfuls of the sticky berries, working quantities of red grease into their hair. With deft combing, they formed a cap of the pulpy mass.

Achiote trees about 20 feet high grew by the house, laden with red pods larger than almonds. Three times a year the trees flowered in pinkish-white blossoms, Toribio told us. The greasy red coloring material comes from around the grape-shaped seeds inside the soft-spined fruit.

We got the scarlet paste on our hands and faces and found it to be effective as a mosquito repellent.

Large citrus trees grew near by. One seven-year-old orange tree was as high as some of our thirty-year-olds, and its fruit was thin-skinned and juicy like that of more mature trees. We told Toribio this, and he gave us one of his rare smiles, hiding his blackened teeth with his hand.

Sunday morning a Colorado pineapple merchant rode by, his entire stock strapped to the blanket of his horse. His hair was combed sleekly in the red-helmet manner and encircled with a white skein of woven cotton, the Tsátchela "halo" for dress occasions.

A sucre (about two cents) bought a large juicy pineapple, which he whacked down the center with a machete, cutting it into four pieces, which we could hold and eat like lollipops. He traded the other pineapple with Toribio for dried red achiote berries, which he would barter as food coloring in Santo Domingo.

We were preparing to leave when Ramon, the chief, walked by on his way to San Miguel. Appearing quite husky in the Colorado costume, he stood about five feet, eight inches, and wore his red-greased locks hanging over his eyes in the sheep-dog fashion of the old-timers.

He shook hands with Vicente.

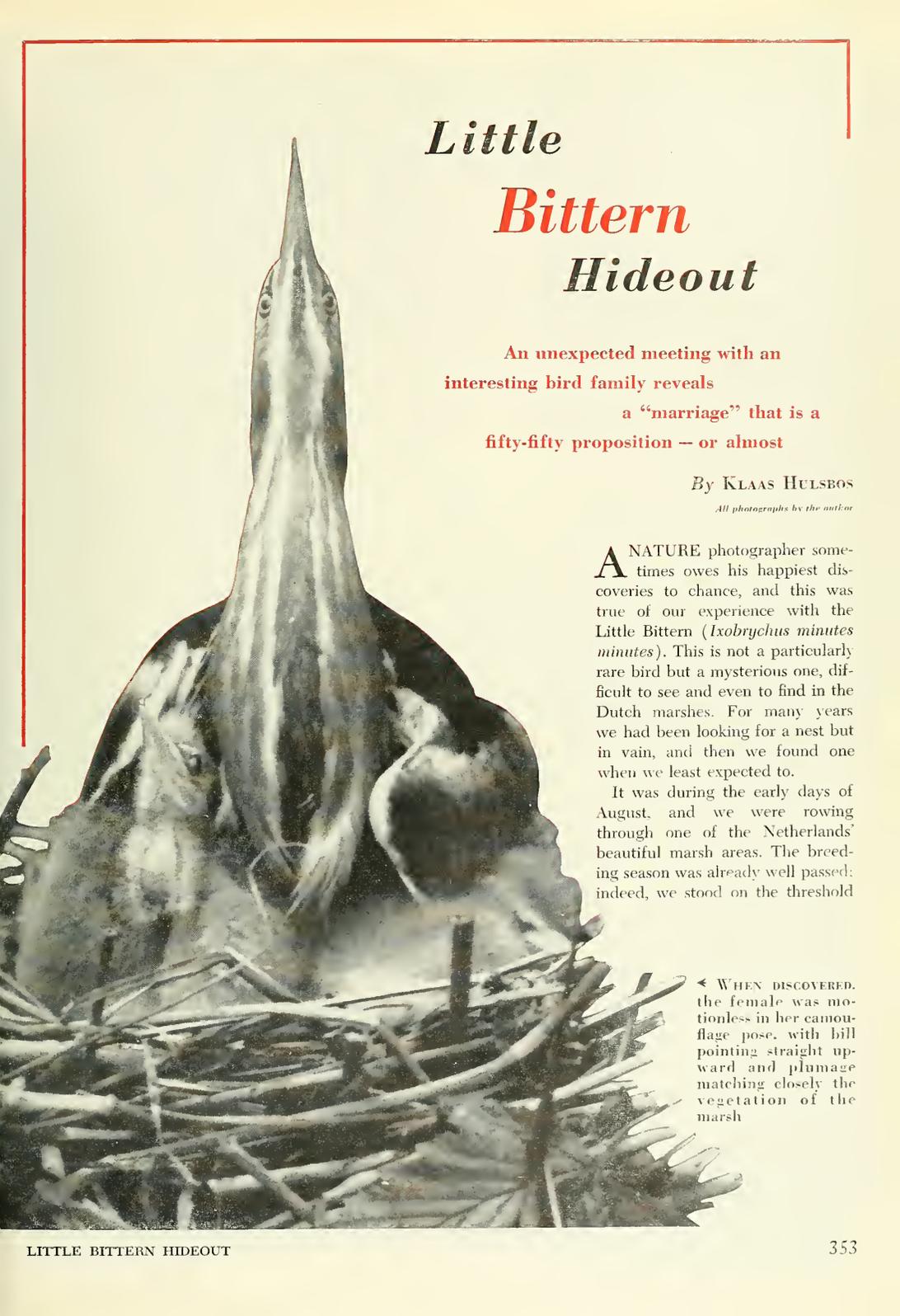
"Tell my friends how old you are," urged our muleteer.

"Seventy but feisty forty," he answered in Spanish, lifting his head to look sharply at us.

The Colorados did not look so strange to us now. We had lived in their home and felt that we had finally become friends. Their soft voices followed us as we rode out on the mud trail.

The little group with all its bright bravado might have to change its happy ways or die out with the rest of the Tsátchela tribe before history recorded much more of it.

We had left them nothing of advantage. Used flash bulbs hung around the necks of the children. The ticktacktoe diagram lay etched in the hard ground, but it would soon be routed out by the pigs.



Little Bittern Hideout

An unexpected meeting with an
interesting bird family reveals
a “marriage” that is a
fifty-fifty proposition — or almost

By KLAAS HULSBOS

All photographs by the author

A NATURE photographer sometimes owes his happiest discoveries to chance, and this was true of our experience with the Little Bittern (*Ixobrychus minutus*). This is not a particularly rare bird but a mysterious one, difficult to see and even to find in the Dutch marshes. For many years we had been looking for a nest but in vain, and then we found one when we least expected to.

It was during the early days of August, and we were rowing through one of the Netherlands' beautiful marsh areas. The breeding season was already well passed; indeed, we stood on the threshold

◀ WHEN DISCOVERED, the female was motionless in her camouflage pose, with bill pointing straight upward and plumage matching closely the vegetation of the marsh



▲ SHE spread her feathers out over her young in this fashion

of autumn. The reedlands had become silent. The Great Bitterns and Herons had long since gone with their young, as had also the Black-headed Gulls. Most of the Black Terns were on their way to their African winter quarters; Great and Little Reed Warblers and many other songbirds had followed their example. Those few remaining had become silent.

It was not the hope of seeing birds that had drawn us into the marshes. For weeks there had been no suitable "bird subject" for the camera, and we were now waiting for migration time, which would bring foreign guests flocking into the country and along the coast.

So, on that memorable day in August, we left the camera at home and took instead fishing rods and tackle, in the hope of catching some carp or bream.

I don't know whether we lacked skill or whether the hot summer day played a trick on us, but it seemed that there was no life left in the pools where fish were normally abundant. After some hours, we gave up fishing and passed the time swimming and sun-bathing.

In the afternoon, thunderclouds came up from the southeast. As the sky became more and more leaden, we felt it advisable to seek shelter ashore before the showers commenced. But hardly had we taken

to the oars before the first luke-warm raindrops struck "cups and saucers" on the water. The wind swept fiercely over the marshlands, bringing a delightful coolness, but there were also flashes of lightning among the cloud masses, and thunder echoed across the water. In less than a moment a summer storm had broken over the marshes. The stormy wind squalls drove white-capped breakers against our boat and bent down the reed walls. Then the rain came. We could see the gray curtain sweeping nearer and nearer, and a few moments later we were lashed with the deluge.

Laboriously we beat our way

against the wind and waves, in the hope of finding some shelter under the lee of a reed wall. Putting all our strength behind the oars, we at last ran aground in a reed bed, dripping wet. With our backs to the wind, we resignedly waited for the storm to end. The fury of the elements was both fantastic and alarming; but like all summer storms, the violence was short-lived. After a quarter of an hour, the rain had decreased so much that we could start home.

My wife moved to the bow of the boat to push us off; but instead of pushing, she grasped my shoulder and whispered in excitement, pointing into the reed bed. At first I could see nothing, and then there she was, a female Little Bittern, four or five feet in front of us, covering her nest and young with drooping wings.

Rain was forgotten, and we both gazed in silent admiration at that glorious little bird. Her typical

motionless attitude, with head and bill stretched straight upward, caused her to resemble so closely the reeds among which she stood that she was almost invisible. One could not imagine a more effective camouflage.

Returning to the marshes with camera the next day, it was not easy to erect a hide or to find a seat, but we managed it at last. Then the photographs for which we had wished so long came without difficulty. Hardly had my wife pushed off in the boat, wishing me "Good luck," when the low, soft "keck-keck-keck" of the young bitterns begging for food attracted my notice. The female was already on the nest, settling down over her chicks with her breast feathers extended like a hen's. The chicks were about a week old. It was a thrill to observe this miniature heron at such close quarters. She stood not more than fifteen inches in height.

Scarcely ten minutes passed before the sound of the young again warned me that something was going to happen. They crept out from beneath their mother's sheltering wings and peered into the dense bed of reeds behind the nest, and there the male appeared. He did not come on the ground. With his long toes grasping the stalks left and right, he climbed through the reed bed almost like a monkey. Both old birds raised their crown feathers and made harmless lunges at each other with their sharp bills. After this, the female left the nest and disappeared among the reeds, and the male brooded the young. The chicks, upon the arrival of the father, looked anxiously for food and tried to seize the bill of the old bird in order to stimulate him to provide them with the food he carried in his crop. While I gazed from my hiding place, one of the young succeeded in grasping its father by the bill and, after some

▼ NOT REACHING for food but assuming the camouflage position that will be effective in adulthood. Until their plumage developed, the pose was useless, but they held it nevertheless





▲ THE MALE took turns with the female in bringing food, and he worked constantly on the nest. The female refused to do this, though she gratefully accepted a reed whenever he brought one

tugging, induced him to regurgitate. Each of the six young were fed in turn while the supply lasted.

The old birds changed places at the nest at regular intervals, sometimes after only five minutes, and the young were fed each time. It was hard to imagine how they managed to catch so many fish at the edge of that little reed strip, probably no more than 100 square feet in area. They could hardly have moved from their breeding island in the short intervals during which they left the nest, yet they always returned with at least three or four fishes.

When the male, after being relieved by the female, disappeared among the reeds behind the nest, he often came back at once with a piece of reed. The female would accept this with apparent gratitude and promptly build it into the nest. Sometimes I noticed that he picked the reed up from the ground, and it was interesting to see how he

maneuvered it. He could not possibly have carried it crosswise in his bill, and he didn't try to. Sometimes he would swing it to and fro many times before getting it into the desired position, which was just as we would hold a penholder between our fingers. The shorter part projected a little in front of the point of his bill, and the longer end lay back against his head. On the other hand, if he picked up a pliable piece of vegetation he would not trouble to hold it in any special manner.

When the male was "at home," he worked on the nest continuously, but the female did little or nothing toward keeping it in repair. Otherwise, the duties were apportioned more or less equally. Changing turns came with clock-like regularity, and no matter how often the parents returned with the spoils of their fishing, they never seemed able to bring enough to satisfy the hunger of the young.

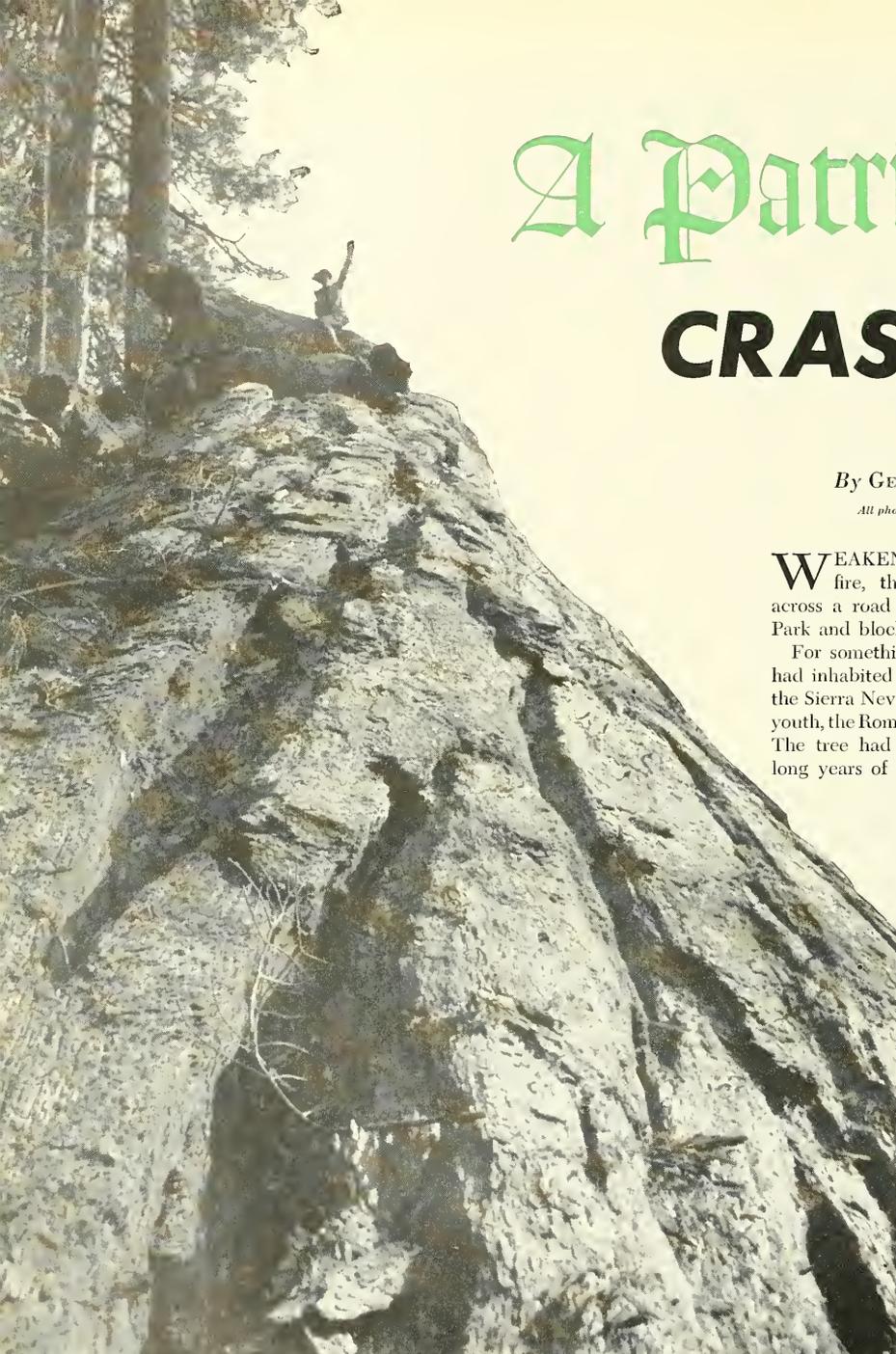
Late in the afternoon, after an agreed signal, my wife came back in the boat to fetch me. The female was on the nest as the splashing of the oars came nearer, and she listened intently as the boat drew up in the reeds. Then, contrary to her behavior of the day before, she hurriedly left the nest.

The gray-white young, left alone, proved to be endowed with the instinct to assume the camouflaging attitude, with head and bill thrust straight up. However, lacking the mottled-brown plumage to blend with the background, this pose was of course completely ineffective, as can be seen from one of the accompanying photographs.

Probably the pouring rain and thunder on the previous day had forced the female to stay with the young. Had this not been so, my wife would almost certainly have overlooked the nest, and we should have missed finding the Little Bittern "at home."



▲ THE FEMALE LITTLE BITTERN feeding the young



A Patriarch

CRASHES

By GEORGE BALLIS

All photos by the author

WEAKENED by an ancient fire, this stately giant fell across a road in Sequoia National Park and blocked the traffic.

For something like 2000 years it had inhabited the western slope of the Sierra Nevada Mountains. In its youth, the Roman Empire collapsed. The tree had matured during the long years of the Crusades. It was

▲ THE DEEPLY FURROWED trunk is seen here from just above the burned-out base. The girl is sitting at a point where a huge boulder shattered the trunk

In keeping with the National Park Service's policy of showing nature untouched, Sequoia can now be examined by visitors throughout its 227-foot length

ready old when Columbus—in his youth — dreamed the world was round.

Some years ago when another tree fell across a level stretch of road in the Park, officials simply cut away a section of it so the traffic could pass. But this time, rangers cut the road deeper and left the tree lying overhead.



◀ PARK SERVICE CREWS gouged out the road beneath the tree so that the monarch could be left for all to examine

▲ TWO THOUSAND years of history lying prone



▲ A PATCH OF SUNLIGHT shines through a light hole where this girl works, in a side cave opening into the big family workroom. The limestone plains of Yucatan and the so-called Puk hills that mark the higher interior level are everywhere honeycombed with underground channels and deep-water sinks

➤ THE COOLNESS AND MOISTURE of the underground workshops help keep the fibres in good condition for the manufacture of delicate, finely woven straw hats

YUCATAN'S

Underground Hatmakers

By Kurt Severin

All photos by the author

Descendants of the Mayas of old adapt themselves to modern markets through one of the strangest native industries in Middle America

BECAL, a typical Mayan village on the Yucatan peninsula, has perhaps 1500 inhabitants, and all of them work at the art of making straw hats, in man-made caves, some 15 feet below the ground. Though the community was founded by the Spanish several hundred years ago, the Maya language is still spoken there.

There is hardly a house in Becal that does not have a hole in its backyard, leading down by crudely hewn stone steps to a working cave. As the family grows, the cave is gradually enlarged. The steady moisture and coolness of the cave keeps the *jipi* fibre, from which the hats are made, in workable condition the year round. The *jipi* palm grows widely in Yucatan and elsewhere in tropical America.

About 8000 hats are made each week in the "cave-man" village. Of these, 7000 are of the general "palma type" and bring about \$3.00 (Mex.) each. About 800 are of five-thread quality and sell for \$20.00 (Mex.), and their manufacture takes six days. Only about 10

hats of the finest sixteen-thread quality are finished every week in Becal, and their makers receive close to \$100.00 (Mex.) each for them. It takes about five weeks to make one of these. These extra-fine hats compare favorably with the best ones coming from Ecuador under the name of "Panama hats." They are feather-weight and silklike in quality, and they never lose their shape.

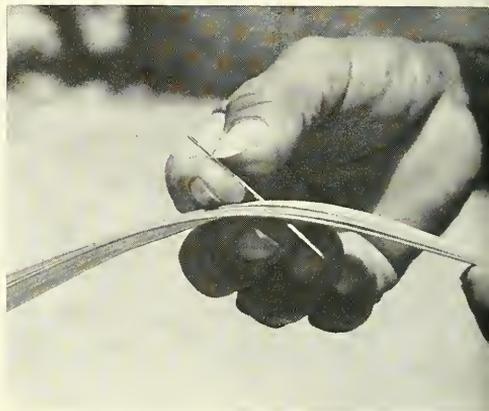
There is even a four-room underground school where the children are taught hatmaking. Teachers paid by the community show them the short cuts and fine points in the art of making straw hats by hand.

Earlier in the present century, the chief product of Becal was pottery, made for the Mérida market. The present industry originated as a government-sponsored development early in the presidency of Calles, under a well-known socialist governor of Yucatan. The development of crafts on a village basis achieved early success in Yucatan and was later adopted in other parts of Mexico on the Six Year Plan of Cárdenas.

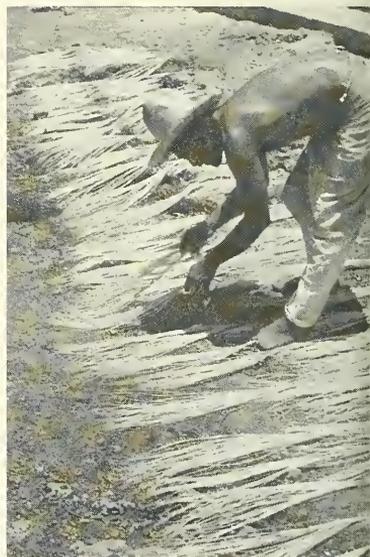




◀ THIS IS THE JIPI PALM, which provides the raw material the straw hats are made from



▲ THE LEAVES of the jipi palm are split into thin, workable strips with the help of a knife



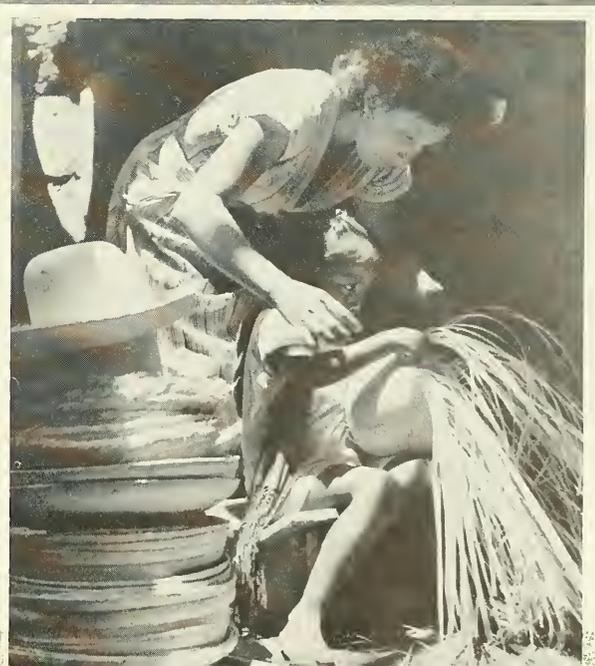
▲ THE FIBRES are then laid out on the street to bleach in the sun

◀ FIBRES COARSE AND FINE are prepared for hats of different quality. The ancient Mayas used palm leaves as building material and in other ways, but the use of the fibres in hat manufacture is a modern adaptation



▲ A TEACHER paid by the community gives lessons in hatmaking in an underground schoolhouse

➤ A DAUGHTER of the ancient Mayas learns to take her place in a modern craft industry, which is putting the town of Becal on the map





▲ ON HER OWN. As her fingers grow supple and skillful, she will aspire to making the finest sixteen-thread hats, which bring their makers close to \$100.00 (Mex.) each

➤ "CAVE-SCHOOL" is out, and the children are leaving for home. Some are taking homework with them to finish with the family. Note the solar light-opening and the round ventilation tubes



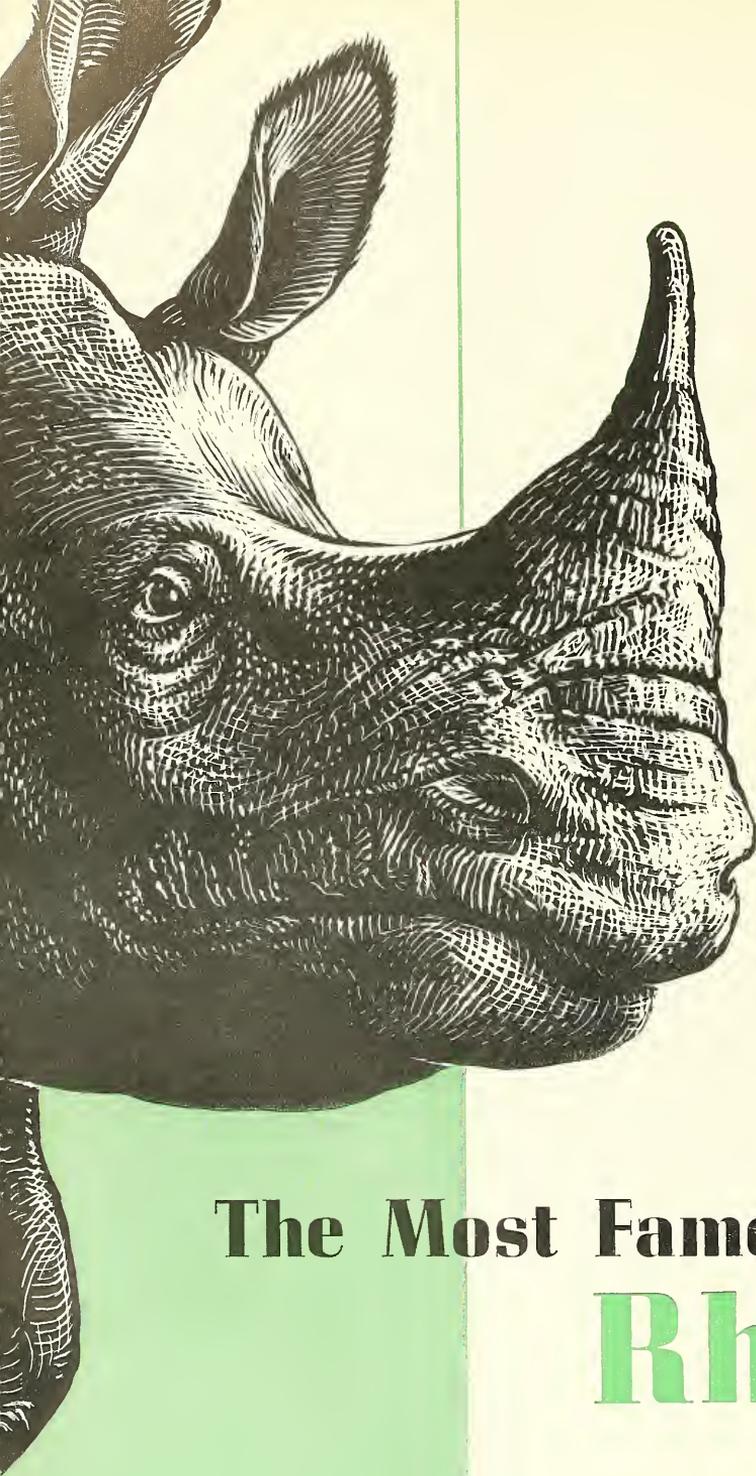
▲ A CONCH SHELL is generally used to smooth out the borders of the finished hat before it is cut and sewn into final shape. The wooden mold is a European idea. The techniques used here are similar to those of the hatmakers in Ecuador. On the stone monuments of the early Maya, plaiting is sometimes seen in elaborate headdresses. Mats also were made in the ancient times



▲ ONE HARDLY SEES anybody in Becal who is not busy with a straw hat. The women walking the streets keep at it in the same way that their sisters elsewhere in Latin America work at lace or drawn work

➤ "HOMEWORK" is marketed through a co-operative organization, which also provides the craftsmen with raw materials. The woman at right wears the traditional Maya costume. The statement on the safe is historically interesting. It commemorates the formation of a union of "Jipi" workers on August 6, 1930. This was a time when native villages were made the basis of a socialistic revival of land rights in Yucatan





I HAD known him probably longer than any other person, and I will remember the first time I met him.

It was on an April day in 1939, and I had taken two friends to visit the Kaziranga Wild Life Sanctuary in Assam. We were shown around by none other than M. C. Miri, the able Assistant Conservator of Forests who, under the direction of the famous A. J. W. Milrow, had cleared Kaziranga of pit-digging poachers and saved the Indian rhino from certain extermination.

We were charged that day by another rhino, and our elephants fled some distance before being persuaded by their mahouts to resume the journey. But this loss of face on the part of our elephants and ourselves was later redeemed when we were leaving the sanctuary. Near the boundary we encountered this large bull. He dwelled, we were told, in solitary exile and had come to be called

He was on
near-friendly terms
with hundreds of people,
but he never escaped
the threats
of his own kind

The Most Famous Rhino

By E. P. GEE

All photos by the author

Drawing by Margaret Colbert

the Boorra Goonda. Miri told us the animal's story and pointed out to us an old wound on his plated hind quarters.

"It might even be safe to dismount and approach on foot," said Miri, and we lost no time in following his suggestion. I was covered on one side by Miri and on the other by one of my friends. Both men carried rifles for self-protection, though the practice has long since been discontinued in Kaziranga. I walked cautiously toward the Boorra Goonda and was able to take a motion picture of him at a range of about ten yards. He stopped grazing, glared with resentment in my direction, and then resignedly turned away. We felt elated at our bravery, and—more important—we had saved face for both our elephants and ourselves.

From that time onward there are many entries in the Visitors' Book referring to the Boorra Goonda and

the distances to which visitors approached him. As the years rolled on and the Boorra Goonda became perceptibly older and feebler, the distances came to be measured in feet instead of yards.

There was still the spark of life in the old rhino. I remember on the morning of January 8, 1950, I arrived at the edge of the sanctuary and was told that the Boorra Goonda and a large cow rhino had been close together at that very spot a few minutes earlier. The bull had moved off before I came, but the cow was still there. Later it turned out that the two had remained together for several days after that.

The Boorra Goonda was not the only old bull rhino exiled to the fringe of the sanctuary. There have usually been several others living at various places; and only several months ago the Divisional Forest Officer and I, while visiting the northern boundary near the

Brahmaputra River, christened a similar old bull—with a different name. The Boorra Goonda himself became so well known because he chanced to live in the locality where visitors to the sanctuary normally enter and depart, the so-called Kohora Grazing.

There is little doubt that these solitary old bulls have become exiles because they have been driven out of the sanctuary by the other bulls. The Boorra Goonda was in constant fear of encountering another bull rhino. He therefore sought refuge on the fringe of the sanctuary near human habitation, where domestic buffaloes and cattle were herded.

I have often observed him grazing in front of me, in spite of the presence of the elephants and myself. Suddenly he would lift his head and prick his large piggy ears in the direction of the far-off sound of something approaching through the long grass. Trembling with ap-

▼ VISITORS on elephant back sometimes saw him wearing water hyacinths, accidentally acquired in a lake



THE MOST FAMOUS RHINO



◀ SOMETIMES he looked like charging, but he never did

prehension, he would stand, ready to move away instantly if another rhino appeared. His fears were not without good reason. On his shoulders, flanks, and hindquarters were bleeding or half-healed gashes inflicted by his own kind—signs of nature's inexorable law of the survival of the fittest.

The extraordinary thing is that the Boorra Goonda loyally refused to leave the sanctuary where his calf-hood and maturity had been spent. Every day he would leave the perils of the sanctuary for the less-dangerous and similar country outside—but only for a few hours. He would then recross the stream that forms the boundary at this place and re-enter the sanctuary, in spite of the danger of almost certain onslaught from other rhinos.

On one occasion, I took a friend on elephantback in search of the Boorra Goonda to photograph him. As we moved in silence through the tall elephant grass where the Boorra Goonda was usually to be found, we heard the crashing noise of a rhino rushing away in alarm. Later we came in view of the Boorra Goonda in full flight; but when he saw us, he immediately resumed grazing, allowing us to

approach to within a few yards. Sometimes he actually approached the Forest Elephants as they were taking visitors around the sanctuary. It is certain that he came to know these elephants and probably also the mahouts, who always called out friendly greetings and inquiries after his health.

Trained elephants are ordinarily scared at the very sight of a rhino and have only one impulse—to flee as quickly as possible. A full-grown tusker elephant is no exception, and I have been on the back of one on several occasions when it fled from a rhino. But the Forest Elephants have usually had their schooling and morale-building with the non-aggressive Boorra Goonda, and

their introduction to him has always been a morally satisfying event. He has enabled them at least to become familiar with the sight and smell of one of these strange, one-horned, armor-plated, prehistoric-looking creatures.

For many years now the first question put by mahouts and visitors on arriving at the fringe of the sanctuary has been, "Where is the Boorra Goonda?" And if the herd-boys answered in the affirmative, the party would move off in the direction indicated, to find the old rhino lying in a favorite muddy wallow or peacefully grazing on some lush grass near a *jheel* (small lake) or stream.

"How old is the Boorra Goonda?" No one has been able to answer this; but as several of his species have lived for over 40 years in captivity, and as the old age of the Boorra Goonda was prolonged over a period of at least fourteen years, it is possible that he lived as long as an Indian elephant, whose span is believed by some to be as much as three score years and ten.

"How is it that the Boorra Goonda was never shot and put



▶ LEAVING his favorite wallow, like an animated tank from an earlier era



▲ EXTREME AGE slowed him down, but he continued to enjoy the pastures of his protectorate—perhaps even the human visitors

out of his misery by the Forest Department?" The answer is that, apart from being an asset to the sanctuary and an attraction to visitors, he was not apparently in great discomfort or pain. Several times I saw him looking much the worse for being buffeted by some younger bull; and, as Honorary Forest Officer of the sanctuary, I would be on the verge of recommending that he be shot. But the next time I would see him, he would be looking very much fitter and be definitely still enjoying life.

"Why did no poacher ever kill him for his meat and horn?" It is true that his meat and horn were worth some Rs3000/(\$632) on the open market, but two main factors ensured his safety. Firstly, there was the deterrent of his being a protected animal, with a penalty of imprisonment up to six months, or a fine up to Rs1000/(\$211) or both. And secondly, there was the fact that he was so well known to all and so much of a character.

"Why did no tiger prey on him?" Tigers appear to be afraid of rhinos. There are cases of a tiger killing a rhino calf, and a case in the last century of two tigers together attacking a rhino that had previously been disabled by a rifle shot, but no tiger has ever been known to attack an adult rhino. In

view of this, the Indian rhino might well be styled the "King of Beasts."

On June 8 of last year, the famous Boorra Goonda—the old bull that had been admired and photographed by so many—died peacefully of old age. But he has a successor. "*Le Roi est mort. Vive le Roi!*" Some seven months earlier, another oldish bull rhino appeared in the same locality that had been the Boorra Goonda's for so long. The new arrival had obviously also been ousted from the sanctuary by his juniors and betters. He had a gash on his nose, three wounds on his flank, and a vertical tear in one ear, which caused him to be called Kan Katta ("Cut Ear"). He was in about the same condition of age and health as the Boorra Goonda was when I first saw him fourteen years ago.

I am glad that I was able to meet the Boorra Goonda and photograph him—for the last time—just a few months before he died. On a Sunday at the end of February, I went down to Kaziranga and found him near his favorite stream. The Range Officer was with me, and we crossed the stream to within a few yards of him. The Range Officer held out some grass in his hand at a distance of about nine feet, but the Boorra Goonda was not interested.

Then, facing him, I walked up with my camera to within eight feet of his head. Occasionally he glanced at me out of the corner of his eye, but he continued to graze with unconcern. Later, when he moved away, he walked very slowly—without a limp and with no wounds showing, but very slowly. I remember thinking that he appeared to be in no pain but that he was not far from the end.

The Kan Katta is there as a successor. But the Boorra Goonda will be sadly missed. He will be missed by the graceful egrets and the neat jungle mynahs which so frequently perched on his back in search of food. He will be missed by the villagers and herdboys of the locality, by the Forest Staff and the mahouts, and even by the Forest Elephants.

The memory of this fine old rhino will linger long in the minds of those who have seen him pushing his way through the tall green elephant grass, or peacefully grazing on the short lush growth of the open spaces, or lying among the water hyacinths of the *jheels* or in the muddy wallows of his native Kaziranga, where he lived so long.

The Dog that wasn't a Dog

By MARSTON BATES



Marston Bates photo

She thought of herself as one,
but a pet terrier
treated her more like a cat

SOMETIMES I used to wonder whether the yellow fever laboratory at Villavicencio, in the Colombian headwaters of the Orinoco, was a laboratory or a zoo. We encouraged the people of the region to bring us any strange creatures that they found, and we carried out extensive animal trapping ourselves. This was a legitimate part of the business of the laboratory. But we tended to keep too many animals around, for we were always acquiring ones that were too interesting or too appealing as pets to let go.

The animal house was thus always well populated, and the overflow came to be housed in various corrals and cages built about the laboratory yard. It became a regular thing, on Sundays and holidays,

for the townspeople to stroll out to the laboratory to look at the animals. Periodically I would find the bill for animal food and care threatening to wreck the laboratory budget. I thought of appealing to the municipal authorities for help, since clearly we were contributing greatly to the town's recreational facilities. But I never did. Instead, when things began to look really out of balance, we would have a grand clean-up and free all the animals we could bear to part with.

Some very interesting animals passed through our hands in this way. One of the rarest of these was A Bush Dog (*Icticyon venaticus* or *Speothos venaticus* in more recent books).

I remember very well the morning that "Icty" arrived at the lab,

led on a string by a bedraggled, barefooted countrywoman in for market day. We had just had a general clearing out of our "zoo," and I had freshly resolved that our purpose was to study viruses rather than to provide room and board for strays and captives from the South American forests. The woman, they told me, had brought a *perro de monte* (wild dog) for sale. The name *perro de monte* was sometimes applied to the kinkajou and sometimes to the grison, a smelly, vicious relative of the weasel tribe. None of us liked grisons, and any that turned up were promptly converted into museum specimens. But they said this was a different animal. So, reluctantly, I went out to look.

It was a queer creature that the

woman had. At first I suspected she was trying to pawn off some village mongrel on us, but even a casual second glance made it obvious that this was different from any possible variety of domestic dog. My ignorance of South American mammals was enormous. I had no idea what this was; and being full of my antizoo resolutions, I didn't really care. As a result of this genuine (though temporary) indifference, we got the dog for a ridiculous price—the equivalent of about a dollar. I never saw the woman again to make amends; and we never got another *Icticyon*, though later, with backing from American zoos and museums, we took to offering fantastic prices. We did get two tiny puppies once, but we were unable to raise them.

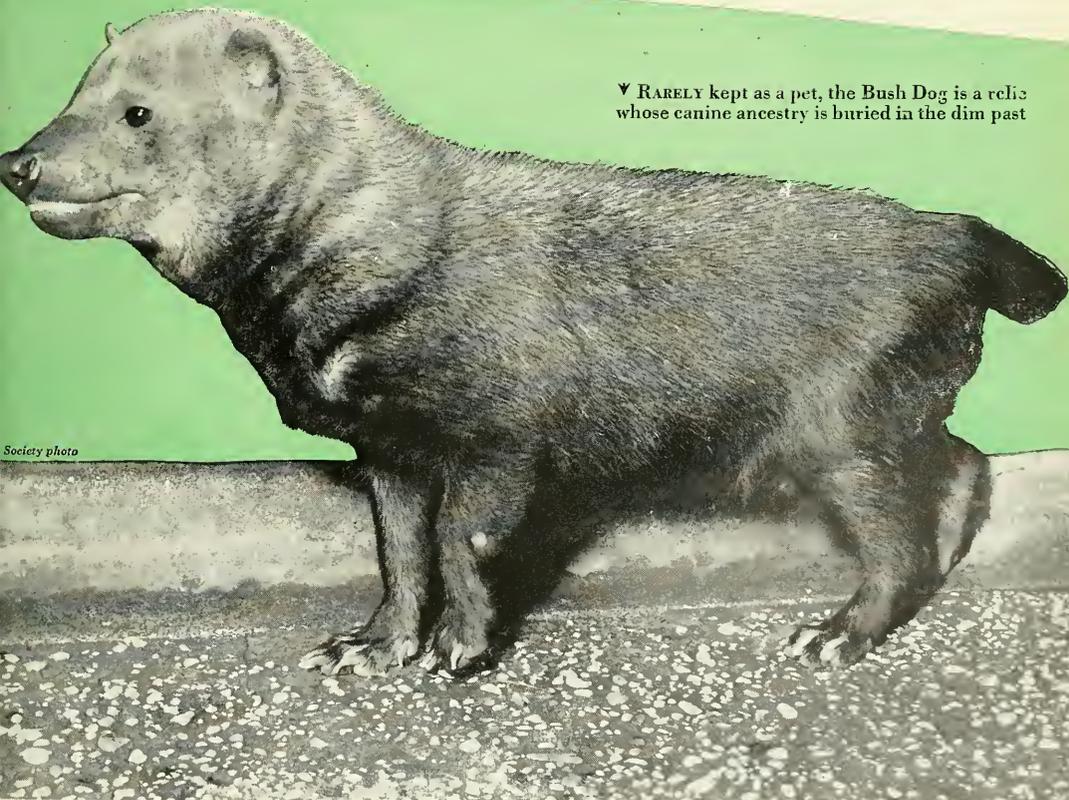
The woman said the dog had

been caught about three months before near where she lived, in the foothills of the eastern Andes on the Guavuriba River. She had allowed it free run about her hut and treated it just as she would a dog. (The life of a dog in these isolated mountain huts is not always enviable.) She said it would eat anything—again just like a dog, since the back-county dogs of the tropics have little chance to be choosy.

The *perro de monte* was taken off to the animal house, and I went back to my viruses, still conscientiously uninterested in zoological oddities. This indifference was broken by my wife, who discovered the dog that afternoon in the course of her daily check on the progress of the laboratory. She had been greeted in the animal house by squeals of delight from the new

resident and had gone in to find out what creature could show such signs of intelligence. We soon discovered that Icty was always overjoyed by a visit from anyone wearing skirts but was quite indifferent to people wearing pants—surely a reflection of experiences in that mountain hut. It took the animal a month or so to learn that kindness and attention could also be associated with people who wore trousers.

We looked through the mammal literature we had and by a process of elimination decided we might have an *Icticyon*, though we found no good picture or description. I got interested enough to write at once to a mammalogist friend and promptly got confirmation, along with most urgent instructions to be sure to save the skin and skeleton. But by that time Icty had wrecked



▼ RARELY kept as a pet, the Bush Dog is a relic whose canine ancestry is buried in the dim past

Society photo

my autizoo plans, and the idea of converting her into a museum specimen was unthinkable.

We discovered that Icty was very fond of water. She would roll and splash in it at any opportunity. This gave us the idea of arranging her quarters by a small cement pool that had once been built for a young tapir. We built a small thatched doghouse near the pool and attached Icty to a wire trolley so that she could have considerable freedom of movement without getting entangled. She soon appeared to be completely at home with this arrangement. She used the pool for recreation, the doghouse for meditation and sleep (though it took a lot of digging before she got the interior fixed to her satisfaction), and one corner of the available grassy area for defecation. Her rations consisted of a half pound of raw beef a day, which she invariably took into the doghouse to eat.

Icty seemed completely tame, as well adapted to man as any dog and very doglike in her habits and attitudes. She never attempted to bite except in play or to get attention. I am sure she distinguished between the different people with whom she came in contact, and except for her early ecstasy about people wearing skirts, she was relatively indifferent to strangers. She always showed great interest in and friendliness to dogs; but this seemed not to be reciprocated. We had a wire-haired terrier at the time, and Icty tried hard to make friends with him. Icty clearly thought of herself as a dog, but Skippy equally clearly classed her as some kind of a cat, so we never dared leave the two together. We tried her reactions to a few other animals, such as monkeys, but she seemed to regard anything except dogs and men as possible food.

Icty was social in the sense of wanting attention from humans. Those of us who played with her would always be greeted with piercing squeals and excited tail-wagging. She loved to have her ears scruffled, and she would roll

over on her back for a belly rub, nipping our shoes or pulling a trouser leg if our attention lagged. Her cry at such times could only be called a squeal—a continuous series of short, very high-pitched notes kept up as long as she was played with and becoming in the end positively deafening. When squealing in this way, she kept her ears plastered down against her head.

When she thought we were near (though out of sight), especially if it was time for her meal, she would give a very different call. It might be described as a series of short metallic barks, very high-pitched, rather like a bird call. This call was, in fact, perfectly imitated by one of the birds that frequented a tree near her corral. The call was usually given for about two minutes, and in intervals between calls she would assume an attitude of intent listening, with ears cocked forward.

Icty loved the pool and spent a great deal of time there. She seemed perfectly adapted to a semiaquatic life and could dive and swim under water with great facility. If you threw a stick, she would chase it just like a dog; and if a rock were thrown into her pool, she would dive and recover it. This seemed purely play, since she did not disturb things that got into the pool accidentally except when we would start throwing in other objects. She would also worry a stick or a handkerchief that was held out to her, in much the same way that a terrier does. There was every indication that with a little attention she could have been taught the whole bag of dog tricks.

I have always liked dogs and been interested in dog behavior. I suspect that we can learn a great deal about man by studying dogs—as is being demonstrated, indeed, everyday in several laboratories. Ordinarily, however, we must study domestic dogs and domestic men. Icty, it seemed to me, offered a splendid opportunity to study a doglike animal that had no long history of modification through an-

cestral domestication. Alas, I never got around to making my studies. I was in a period of "keeping my eye on the ball" in the yellow fever work, and the psychoanalyzing of Icty could always wait until next month. But one noon, six months after she arrived at the laboratory, they brought in Icty's corpse. She had died very suddenly; we were only able to guess at some sort of accidental poisoning. So we carefully preserved her skin and skeleton and shipped them by air express to Harvard's Museum of Comparative Zoology, where they were gratefully received.

Very little seems to be known about the habits of *Icticyon* in the wild. The animal seems particularly elusive, since it is hardly mentioned even by the explorers. Specimens in museums come from such widely separated places as Panama, Peru, the Guianas, and the coastal mountains of Brazil. It must, then, have a wide distribution; but since there is only a specimen or so in our museums from each of these localities, we must assume that it is a rare animal everywhere.

The doglike behavior of our pet is the more surprising because *Icticyon* is not a particularly close relative of the domestic dog. In the family Canidae, all of the varied wolves, foxes, jackals, and so forth go together to make the sub-family Caninae. But this bush dog of South America is not included here, nor is the dhole (*Cuon*) of Asia or the *Lycan* of Africa. Together these three make up a separate subfamily, the Simocyoninae. (Also the South African *Otocyon* is in a subfamily by itself.) *Icticyon*, then along with these African and Asiatic relatives, represents a survival of a type of canine that was much more widespread in the geological past. Our alert and intelligent Icty belonged to a line that was losing out in the unfolding of canine evolution. So our pet terrier had protocol and systematics on his side in refusing to admit Icty to proper dog society, though I think he went a little too far in trying to treat her the way he would a cat.

Why do burs STICK?

ALMOST everyone who occasionally strolls in the woods or the fields knows what it is to come home with a mass of burs to be removed from his clothing. Without a microscope or a good strong hand lens, we would not ordinarily see why they stick so tightly. Hooks on the ends of the "needles" or backward pointing barbs along their sides are the explanation, as seen in these photographs.

Just why burs are equipped with these hooks and barbs is an interesting question. Burs contain seeds, and the sharp points on them are no doubt valuable to the plants in preventing animals from eating them. A seed that is chewed up and swallowed will not sprout and grow. Thus, in the long process of evolution, seeds protected with sharp points have had a better chance to survive and produce a new generation.

But in the burs, the points have become further modified so that they attach themselves to a passing animal. This is an advantage to the plant in that it enables the seeds, which are not of themselves mobile, to be scattered over a wide area. A plant that drops seeds only around its own stem competes with itself to some extent. Seeds equipped with fluffy parts that enable them to be wind-borne are thought to have an advantage in the struggle for existence. In the same way, seeds enclosed in burs are more apt to find a fertile spot in which to grow than purely "sedentary" ones. This, at least, is the customary explanation of why they have so often developed "hitchhiking" abilities.

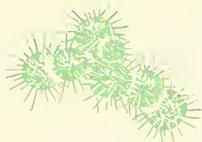
Of course, it is just as important for the seed to be dropped as it is for it to be picked up. The theory therefore assumes that the animal that picks up a bur will generally remove it with its teeth or by scratching.

Photographic enlargement reveals part of the answer,
the study of evolution the rest of it

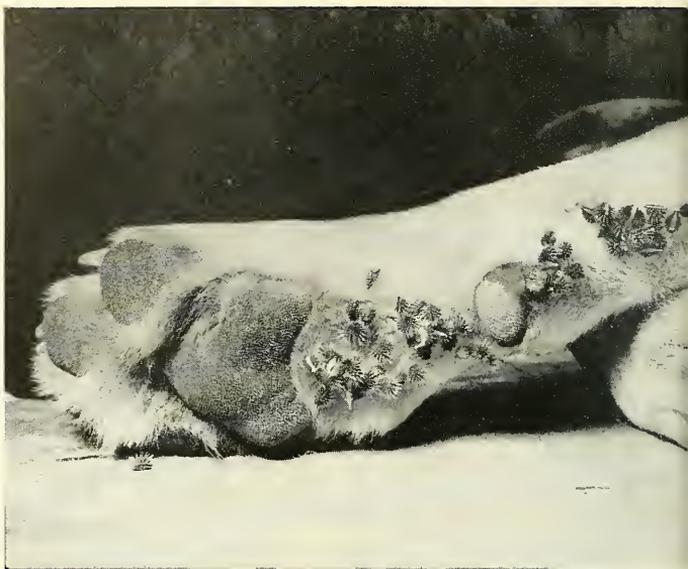
By JOHN H. GERARD

Photo by John H. Gerard

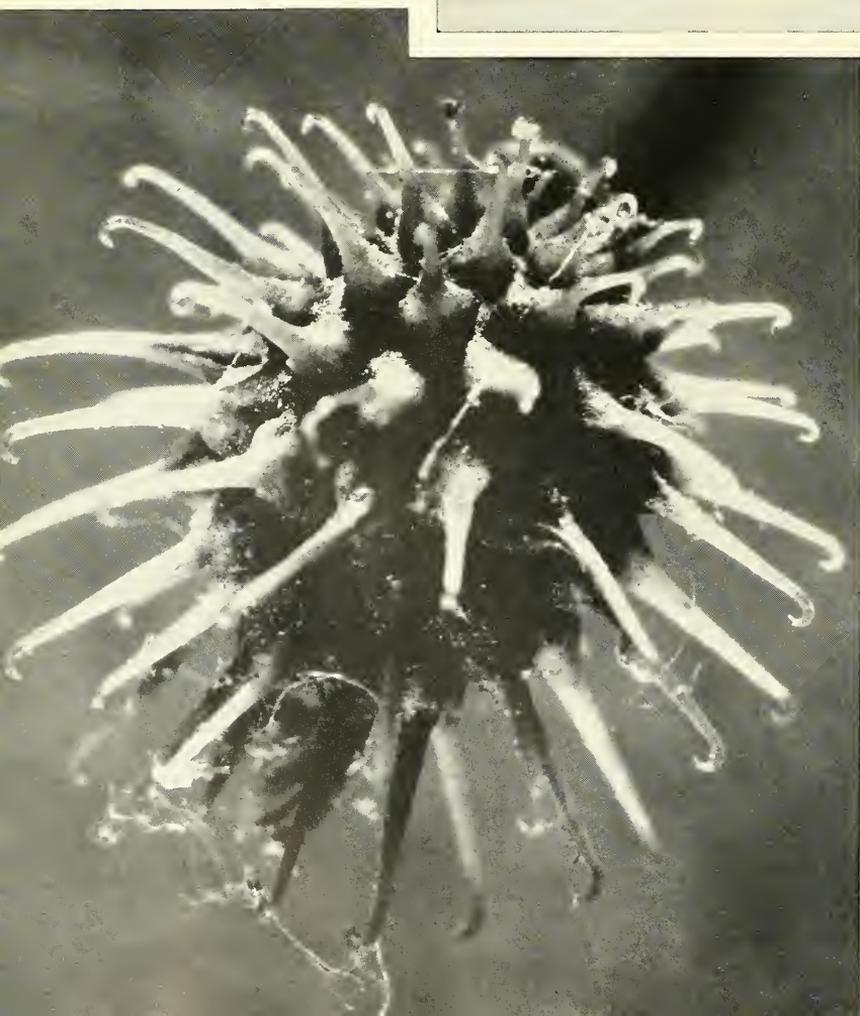




➤ THESE BURS may have ridden for miles. If they do not fall off when the animal brushes past some object, they may be removed by its mouth. They are mostly from the Black Snakeroot (*Sanicula canadensis*)



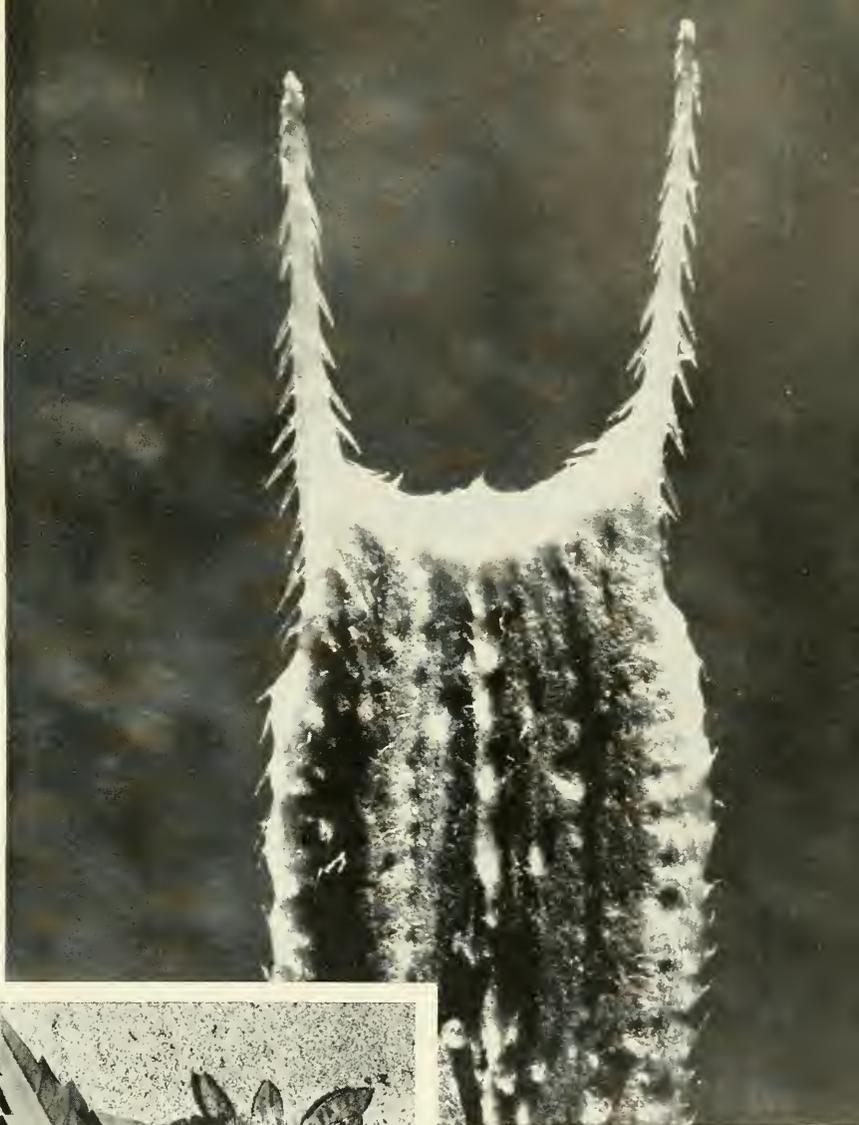
Photos by John H.



◀ HIGHLY ENLARGED, the bur of the Black Snakeroot shows why it is such a hanger-on. Hooks at the tips cause the bur to be carried far from where it grew. Its actual size is about $\frac{3}{16}$ of an inch



THIS ENLARGED VIEW of common Beggar's Tick (*Bidens vulgata*) shows how it becomes fastened to a passing animal or person. The hooked ends go into fur, clothing and are hooked in place. The "tick" is actually about the size of a grain of rice



Photos by John H. Gerold



◀ THE FLOWER CLUSTER of the Beggar's Tick shown here has a small amount of orange color and is inconspicuous. When it dries (*center*), the fruit cluster fans out. This well-known plant belongs to the composite family, which includes the zinnia, daisy, and sunflower and is the largest plant group on the American continent



WHY DO BURS STICK?



Photo by John H. Gerard

▲ THE TICK TREFOIL (*Desmodium caescens*) bears fruit clusters that adhere readily to clothing because of their dense hairiness. They are related to the beans and peas in the legume family and are bothersome as weeds. Their success in competition with more valuable plants is no doubt due in part to their ability to hitch a ride. Though similar to a pea pod, this type of fruit does not split open at maturity but breaks into one-seeded joints, each of which can attach itself to an animal for dispersal



Photo by John H. Gerard

▲ THE COCKLEBUR (*Xanthium*) is well protected against being eaten by a passing animal and also enjoys a free ride on occasion



Photo by Henricks Dodge

◀ THE CAPSULES of the Tick Trefoil lose their resemblance to a pea pod when they become separated. Thereupon, they readily stick to the hiker's trousers and present this familiar but unwelcome sight



▲ ZEBRAS stampede across the East African veld in Robert C. Ruark's film "African Adventure" (RKO)



▲ HARRY SELBY and RUARK with a hunter's reward—in this case a dead Tanganyikan waterbuck



▲ MORE LOOT—a king-size elephant, which Ruark bagged

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

"Africa Adventure"

Reviewed by HAROLD E. ANTHONY

*Deputy Director and Chairman
of the Department of Mammals
American Museum of Natural History*

ROBERT C. RUARK'S "Africa Adventure" is introduced as an attempt "to show Africa as it actually is." Some comment is made of the nonsense about safaris hitherto filmed, and the viewer is led to expect a story without any frills.

It must be admitted that this is a stark revelation of how far African adventure has degenerated since the days of Sir Samuel Baker and Frederick Selous. Then it was man against the African environment with only a few technological factors favoring man. He had no trucks nor jeeps, he lived off the country, he expected hardship as the rule and not as the exception. He was usually on his own with a native gun bearer or two but not backed up by one or more white hunters. Furthermore, the power of his firearms was anemic by

comparison with the lethal capacity of today's safari.

Ruark is frank about the killing that is filmed. In Africa, nature is ruthless and the strong prey on the weak, a fact no one will deny. This film is primarily concerned with the hunting and killing of animals. Its principal appeal will be to sportsmen. The lay public may deplore the emphasis on killing, and even wonder why some of this mechanized maneuvering should be characterized as "sport."

To the average individual, this will pass as a grade B movie. It lacks photographic excellence in many places; in comparison with much of the currently available African films it has little to recall with pleasure; and despite the early claim that "nothing in this picture was staged," it is obvious that some of the closeups of the hunters just before the critical shot was fired could not have been contemporaneous with the action. It is stated that one tribe has spearsmen who can knock your hat off at one hundred yards. Some spear throwing!



▲ THE LAVISH CORONATION SCENE of Horemheb (Victor Mature) and Baketamon (Gene Tierney) from "The Egyptian"

"The Egyptian"

HOLLYWOOD has been getting around a lot in distant lands in the last few years. We now have "The Egyptian" (Twentieth-Century Fox), based on the book of the same name by the Finnish author Mika Waltari. Miss Nora Scott of the Egyptology Department of the Metropolitan Museum of Art is our reviewer.

"Truth is not only stranger than fiction but much more interesting. This inter-

minable and pretentious film could so easily have been absorbing, dealing as it does with one of the most fascinating periods of history, set among the cities and palaces of the ancient world. But O, that history; Those palaces! Overflowing with five million reproductions and near-reproductions of Egyptian antiquities, of every date and mostly in the wrong places, they make it practically impossible to keep one's eyes on the actors and one's mind on the story. There is certainly always something to look at, how-



▲ SINCHE (Edmond Purdom) and Horemheb are decorated by Akhnaton (Michael Wilding)



▲ HERE Sinuhe is finally convinced he's Pharaoh after visiting the tombs of his ancestors

Brief comments on films previously reviewed

Documentary and Grade A

Conquest of Everest
One of the greatest achievements in the history of exploration magnificently filmed

Out of This World
The best color film on Tibet that has been made available to the public

The Royal Tour of Elizabeth and Philip
Beautiful and elaborate dance scenes, memorable scenery dignified

Down the Alphabet

The Vanishing Prairie
A Disney film dealing with the vanishing wildlife of the American Prairie

Elephant Walk
Life on a Ceylon tea plantation

The Naked Jungle
Story of a Brazilian plantation owner's efforts to get a wife, and their struggle against the elements

What the Experts Said

Stirring epic from on-the-spot material

Instructive, entertaining film, with some window dressing

Native customs that have become part of the pageantry of a world society on a wider stage

Exciting, instructive, and highly entertaining

Elephants and cast put on a good performance

An entertaining melodrama with some unnatural history. Not filmed on location

ever, and the film will probably appeal because of its unusual setting; so it is doubly unfortunate that it should be so misleading. Nevertheless, it does give some idea of the life of the time, particularly that of the poor, and many of the street scenes are excellent.

"The story tells of Sinuhe—the foster child of poor parents but in reality, of course, the oldest son of the pharaoh—and his pursuit of *The Answer*. The search introduces him to a number of stock characters: the beautiful temptress,

the unselfish wife, the ambitious soldier, the cruel princess, the noble madman, the faithful servant. The actors are all as good as their quasi-Biblical, sententious lines allow them to be. Edmund Purdom is well cast as *The Egyptian*; Jean Simmons is attractive as the wife; and Peter Ustinov supplies a desperately needed touch of humor; but the best-dressed are the lions.

"Among the objects that stand out from the welter of Art are the alabaster lamps copied from Tutankhamen's, much love-

lier in use than one had expected. Color and sound are good. Just remember that there were three kings between Akhnaton and Horemheb (though the picture had one succeeding the other), that the Egyptians wore plain white linen—they even used handkerchiefs—and above all that they had an all-pervasive sense of fun."

Your editor received a long release telling of the efforts made in the interests of accuracy. It seems to me that Sinuhe sought truth with a capital "T," and the producers got off the track.

"Duel in the Jungle"

"**'DUEL IN THE JUNGLE,'** (Warner Bros.)," writes Dr. Harold E. Anthony, who needs no further introduction to the readers of this column, "is a composite made up of a rather improbable plot laid in a synthetic Africa. The story deals with an attempt to collect life insurance for a fictitious death, and the duel is between the insurance representative and the man supposed to have been drowned at sea. The action ranges from England, via shipboard to Africa, and then into the interior, where the photographer has a field day. The film shows animal life which most certainly was in one of the protected areas and then skips about for scenic effects, sometimes along such well-traveled routes that a hotel should have been just around the corner. With these samples of remote, untrammelled Africa to demonstrate how sequestered is the hide-out of the would-be insurance collector, the principals of the duel are brought face to face."

Mr. T. Donald Carter, who is associated with Dr. Anthony in the Department of Mammalogy and also knows Africa well from firsthand experience, likewise found his scientific senses jarred. He writes: "The 'baboon' that busied itself by throwing the equipment from a jeep was in reality an Asiatic macaque far from home, and, unless my eyes deceived me, there were Asiatic elephants mixed in in the elephant 'stampede.' Anyone knowing the reactions of African natives to a cobra would wonder at the nonchalant way the safari boys were walking past as the hero was saving the heroine from one of these snakes. And a man as well versed as our hero should certainly know that there was nothing at all to fear from the descending python, whereas it was for no good reason at all that he let his presence be known to a much more potent enemy by shooting a revolver."

As Dr. Anthony sums it up, "For those who like plenty of action, and are not too critical of the likelihood of things, *'Duel in the Jungle'* is reasonable entertainment. As a representation of what one should see in Africa, the film is utterly impossible."



▲ "DUEL IN THE JUNGLE" takes the viewer to the fictional Africa of safaris and jungle romance



▲ JEANNE CRAIN AND DANA ANDREWS look pretty well-dressed to be going down the rapids of an African river

plant may have sharp, rigid spines, which become suddenly quite conspicuous when the leaves descend or fold together. It has been suggested that these serve more effectively to protect the plant from grazing animals when the leaves are in the "sleep" position.

So you can take your pick. There are plenty of botanists who interpret these movements as incidental. There are others who find it hard to believe that the sleep movements could persist in the course of plant evolution in so many unrelated groups unless they had some definite survival value. It may be that we just aren't smart enough yet to interpret things fully.

Eagle through Windshield

SIRS:

When I was employed in Wyoming as an engineer for one of the major oil companies, I used to put in quite a bit of spare time bird-watching with a young engineer named Drummond Aitken in the region around the Salt Creek Field, close to the famous Tea Pot Dome. The golden eagles shown in the photographs had their nest in a large pine tree, and it had evidently been in use for a good many years, for it contained about a wagonload of sticks. We could look down into the nest from the edge of a cliff that was only 300 or 400 feet away. The nest contained three eggs, and after these had hatched and it began to look as though we would not be able to watch the young eagles much longer, Mr. Aitken climbed to the nest and took these pictures. The young birds did not seem to be particularly alarmed by his visit and were quite accommodating in moving around for different views.

I wonder whether any of your readers have ever had an experience like the one two officials of the oil company ran into one day when they were driving out

from Casper. They topped a small rise just when an eagle was eating a jack rabbit in the road. The bird did not have time to get in the clear, and non-shattering glass had not yet come into general use. The bird crashed through the windshield, taking the glass with it. When the men stopped and took stock, they found that neither of them was seriously hurt, and they had a very dazed eagle sitting in the back seat! They drove on into the town of Midwest, and the bird remained perfectly quiet. It didn't appear to be injured but just stunned, and after several hours, it recovered and flew away. One of those men is now President of one of the major oil companies and the other its Chief Engineer.

ARTHUR W. BUELL

Golden, Colo.

The Nava-Hoist

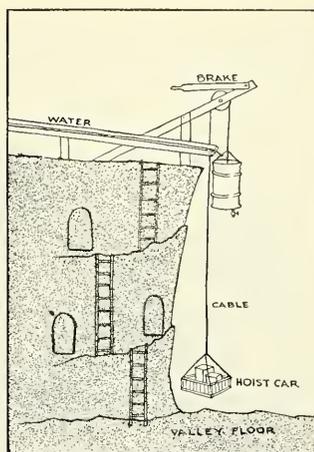
SIRS:

While on a hunting trip in northern New Mexico I ran into one of the most unusual examples of mechanical ingenuity I have ever seen.

On a plateau called Ukniki, which rises some 300 feet above the rutted valley road below, live a group of Navajos. They climb to their high mesa by a series of crude ladders and steps cut into the face of the cliff. But they raise heavy supplies and other articles by a hoist. This elevator, capable of lifting many tons of material a day, is operated at no cost and requires no physical exertion.

A small stream that rises in the mountains spills off in a small falls to the gorge below. The Navajos have diverted a portion of this stream into a small flume, which pours over the edge of the cliff where the hoist is located.

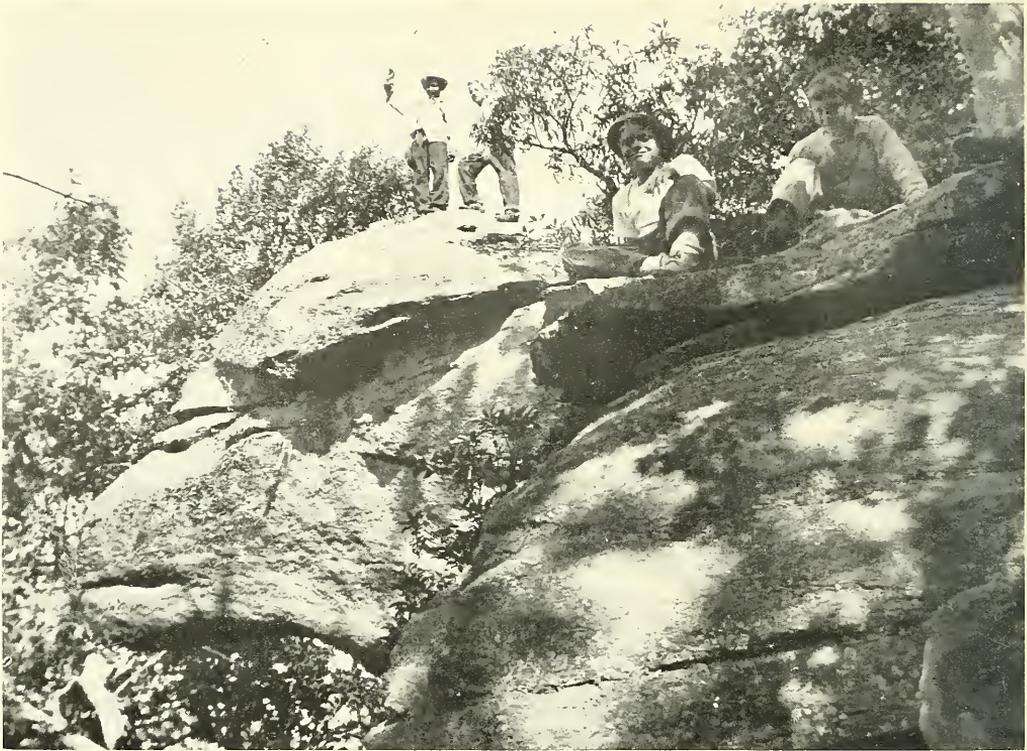
The hoist consists of an open-topped 50-gallon oil drum which, when filled with water from the flume, furnishes the lifting power. The drum was inverted, so that the filler plug was on the bottom



and acted as a drain plug for emptying the barrel after a load had been raised. At the other end of the cable was a carrier platform outweighing the barrel by a few pounds. Figuring the weight of water at roughly 8 pounds to the gallon, the barrel when filled with water from the flume easily raised approximately 400 pounds. A crude friction brake was arranged at the pulley wheel to control the speed. Since the Navajos did not know the wheel before the coming of the white man, I presume they have picked up the idea for this machine from outside.

WILLIAM HOULETTE THOMPSON
Represa, Calif.





Gargoyle in the Mountains

SIRS:

So far as I know, I am the first person to have photographed this "natural gargoyle." It is located in the Blue Ridge Mountains in the southwest tip of North Carolina, about ten miles from downtown Hendersonville. The rock is accessible only by a half-mile climb up the side of the mountain through brush, over streams, logs, and rock. The formation is hidden by trees, which cover the whole mountain, and this rock is little known even among the natives. These pictures could be taken only after I had chopped down six trees and trimmed a seventh.

The photograph shows a few of the children we took on this camping trip, and I thought perhaps some of the readers of NATURAL HISTORY Magazine would be as interested in it as we were.

BERNARD LUBLIN

New Haven, Conn.

Coons Galore

SIRS:

In last February's NATURAL HISTORY Magazine I saw the photograph showing raccoons on a doorstep in western Canada, mooching for food in winter. The letter states that 20 of them came. Well sir, we have that right here in the Cats-

kills in July and August when food is supposed to be plentiful.

The mothers bring their babies to me to be weaned. They also prop themselves against my kitchen door and nurse their young in broad daylight. Some have three, others four babies, all busy at once. During this session, the mothers croon a monotone that sounds like middle C on the piano. Then they leave up to 15 babies with me, while they go off on their own business through the day.

When these youngsters encounter their

first thunderstorm, they all make a beeline for my kitchen door and want to be taken in. I don't dare touch any of them as they are quick as lightning, wild, and have very sharp teeth. They do *not* wash their food, as is frequently claimed. I sit out on the lawn and feed them individually by hand, and they crawl all over me. So you see we have interesting raccoons right here in the U.S.A.

Mrs. F. W. MINGST

Kingston, N. Y.



sources and evolution of its bird life, the size and controls of the populations, the seasonal movements, means of navigation, and patterns of sexual and social behavior. Then follow six chapters discussing family and ordinal groups of birds, such as the petrels, the pelicans and their allies, the skuas, gulls, terns, skimmers, and the auks. An appendix lists all the North Atlantic sea-birds and their distribution. A well-chosen bibliography of more than 400 titles, and subject and author indexes, complete the volume, which is well illustrated by charts and diagrams and by reproductions of both black-and-white and color photographs.

The authors accept the ecological division of range first proposed by Wynne-Edwards, which divides sea fowl into inshore, offshore, and oceanic species. These bounds are transgressed, of course, during migratory movements, of which Fisher and Lockley give many examples from recent literature. Thus a young arctic tern banded in West Greenland in July, 1951, was recovered dead in Natal, South Africa, 83 days later, a flight involving a minimum beeline distance of 11,000 miles.

This book is filled with so many significant and critical data from original sources that no brief review can more than hint at its usefulness. There is scarcely a branch of biological discipline, from embryology to behaviorism, that is not brought to bear. The authors credit little on mere tradition or faith, and one important function of their text is to deflate ideas that have existed by virtue of pure inertia throughout several human generations. Thus they point out that the pyriform shape of the egg of the great auk and the razorbill may have a closer adaptive relation to the curious shape and position of the brood-patch in these species than to the much admired propensity of the egg to turn around its smaller and rather than to roll over the brink of a ledge. They decry the idea that neither eggs nor young of waterfowl should ever be regarded as a human food resource, pointing out that sometimes half the annual output of a large and well established colony may be "cropped" every year without affecting the maintenance of a full or overflowing population.

A few dubious statements, misinterpretations, or definite errors have found their way into their condensed text, but, fortunately, they have little bearing upon its prevailing reliability. The authors

have confused (pp. 120 and 216) the distinctive feeding habits of three widely distributed tropical boobies. They refer to the red-billed tropic bird as a "small species;" it is actually the largest. The main wintering place of Sabine's gull is certainly not "off the coast of Peru," but rather in the warmer coastal water to the north, west of Colombia and Ecuador. A "purple throat-sac" is hardly a description applicable to any man-o'-war bird. Finally, it seems inadvisable to have dragged the Wegener hypothesis of continental drift into their zoogeographical discussion, not because the theory itself is unworthy of consideration, but rather because the geological age of such a phenomenon would eliminate it as a factor in the distribution of seabirds throughout the whole Tertiary period or longer.

R.C.M.

A THOUSAND GEESE

- - by Peter Scott and James Fisher

Houghton Mifflin Co., \$4.00
240 pp., 16 pls., 11 maps, 36 figs.

THERE HAS always been a certain amount of mystery surrounding the Pink-footed Goose. Although it winters by thousands in England and Scotland

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and more sparingly elsewhere in Europe (it has been found once in the United States), no breeding colonies had ever been found of sufficient size to account for their numbers. The first authentic eggs of this goose were found in Spitzbergen as recently as 1855 and the first record of its nesting in Iceland was made in 1929.

Nevertheless, the evidence from Iceland suggested the possibility that the principal breeding grounds of this goose were somewhere on that island. The Gray-lag Goose nested on the coastal areas of Iceland, but there were reports of the Pink-foot farther in the interior near the central glaciers. Accordingly, a party of four set out in 1951 to investigate the matter.

The geese were there. In the limited area covered by the party, enough were found to make a careful estimate which indicated the presence of about one-third of all the Pink-footed Geese in the world and probably three-fourths of all those in Iceland. Most of the adults were in molt and flightless as, of course, were the goslings. Efforts were directed toward banding as many adults and young as possible, herding them into pens set up as occasion warranted. The results far exceeded the expectations of the party, and 1151 birds were marked. Interestingly though not surprisingly, two of the captured birds were found to have been banded previously in their winter range.

Much of the story is quoted directly from the diaries of the authors, giving a day-by-day narrative of activities and discoveries. In addition to the accounts of the geese, there are notes on other birds encountered, on the plants of the region, and on other topics of interest. Some discussions are presented in a series of appendices, including a list of the plants of the area by Dr. Finnur Gudmundsson, Director of the National Museum of Iceland and a member of the expedition.

The account is an interesting one and the authors, as well as the other members of the party, are to be congratulated on the more than successful outcome of their venture.

JOHN T. ZIMMER

WHAT ANIMAL IS IT?

by R. Bigalke

Publ. by Trustees of the S. Africa Bird Book Fund and The Mammals of South Africa Book Fund, Pretoria, South Africa, 7/6, 187 pp., 56 illus.

THIS is a small book, which can be conveniently carried in a coat pocket or a modest-sized handbag, but within its pages are concentrated the significant data on the wildlife to be found in the Kruger National Park of South Africa.

The average visitor can well expect to see something that is unknown to him, and "What Animal Is It" must be the question most frequently asked.

The well-selected pictures and definitive text ably introduce the mammals, birds, and reptiles selected for this directory.

The book is a "must" for anyone planning a visit to Kruger Park; it will be very helpful in any of the African back country; it can also be enjoyed by nature lovers who stay at home.

HAROLD E. ANTHONY

THE GIANT CACTUS FOREST AND ITS WORLD

by Paul Griswold Howes

Duell, Sloan and Pearce, \$7.50
1 color plate, 31 photographs, and 30 line drawings and illus.

NOWHERE else in the world is there anything quite like the Giant Cactus forest of Arizona. From the naturalist's point of view its strange assemblage of plants and animals is unique; and even the casual tourist, who knows nothing about these, catches his breath in wonder at sight of the thousands of great Candelabra Cacti. This book is not meant for the casual tourist, but for the keen nature lover; yet there must be thousands of ordinary people who have had their curiosity aroused by Walt Disney's "The Living Desert" and who want to find out more about the desert's fascinating wildlife. This book will not be too difficult for them, for it is written with great charm and interest, as well as accuracy.

One wishes that there were many more books dealing with an environment and its plants and animals as a whole. No other approach is quite so rewarding. The book is also notable for its good typography and production.

NICHOLAS CUPPY

THE TREES AND SHRUBS OF THE SOUTHWESTERN DESERTS

by Lyman Benson and Robert Darrow

Univ. of Arizona Press, \$8.50
437 pp., 84 figs.

THE observant vacationist or serious student of plant life will welcome this guide. Both authors hold the Ph.D. degree and are well trained in this field. Numerous photographs in color and black and white, as well as drawings and colored distribution maps will help to introduce the reader to the more intricate aspects of botany discussed in the text. The book is a bit large and detailed for the traveler who wants to do it once over lightly.

new mother

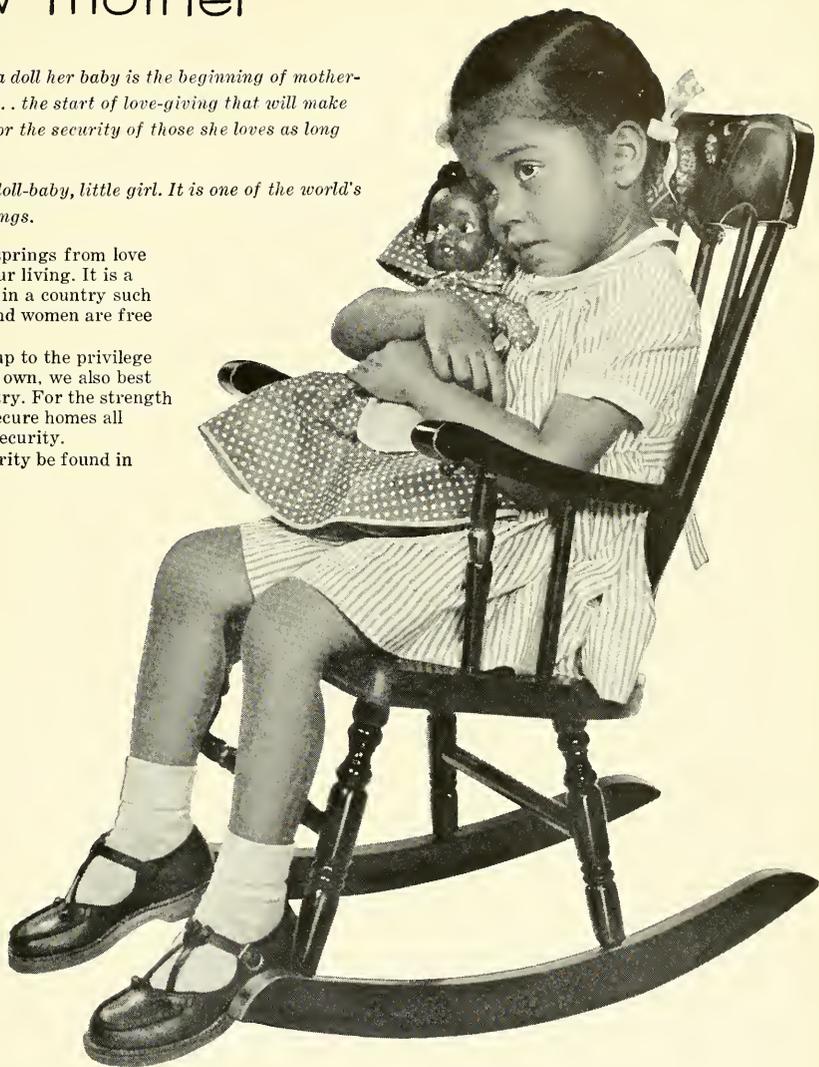
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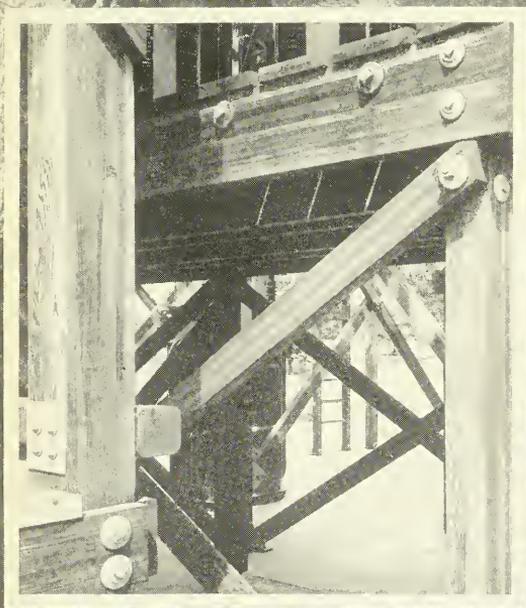
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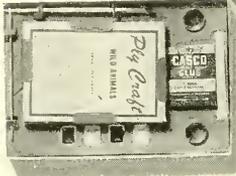
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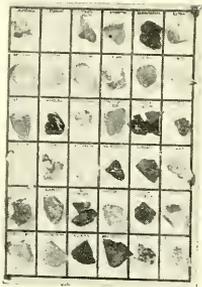
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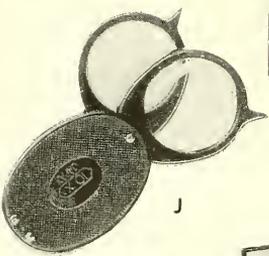
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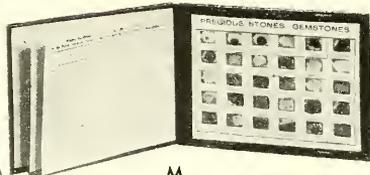
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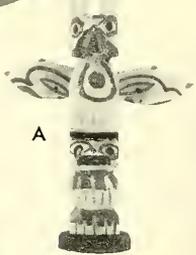
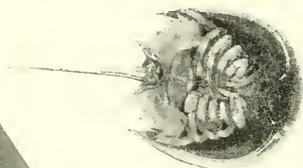
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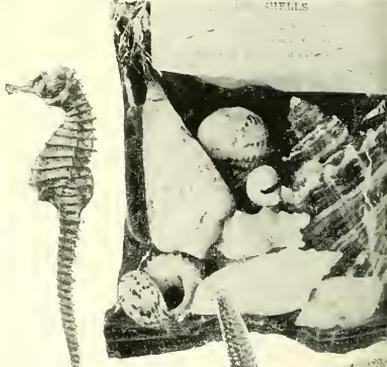
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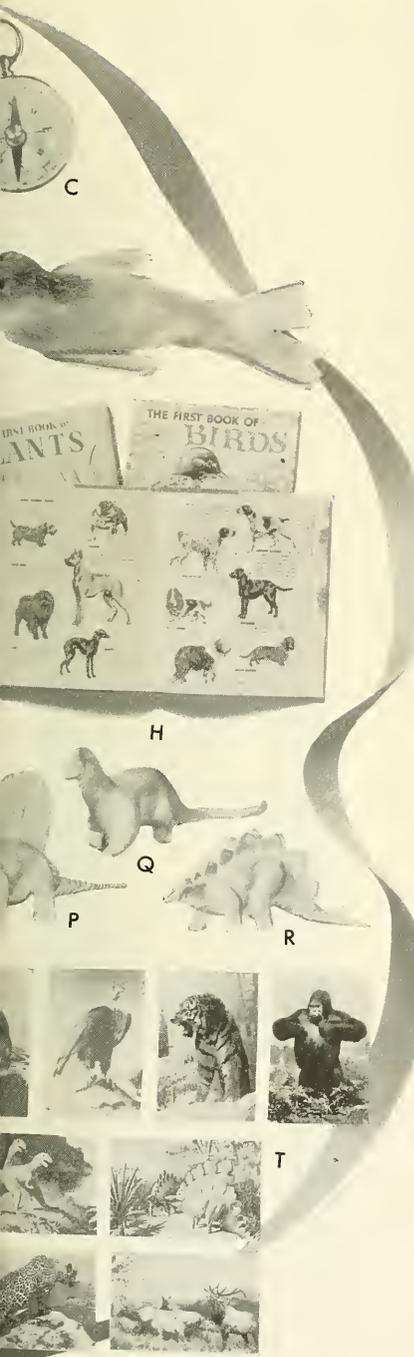


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THE MUSEUM SHOP

THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK 24, N. Y.



T. O. Johnston photo from Robert M. Ormes

LETTERS

It's Your Concern Too

Sirs:

Weldon Heald's trenchant article about the dangers facing Olympic National Park is an accurate and stirring plea for recognition of the responsibility every citizen must take to ensure the permanent security of our National Park system. Similar descriptions could be written of the battles to preserve the Grand Canyon, Glacier, Yellowstone, Yosemite, and, in fact almost every one of our National Parks and most of our National Monuments.

Your readers may be interested to know that it was Dr. Willard C. Van Name, the distinguished scientist of the American Museum of Natural History, who sparked the movement that culmi-

*The llama had a little llam.
Its fleece as black as ink is.
But mamma llama calls it yahm,
As would the ancient Incas*

nated in the preservation of Olympic Park. He inspired Mrs. Charles Noel Edge, Chairman of the Emergency Conservation Committee, to undertake a public campaign to have the great rain forest preserved. The Committee worked for years, gradually arousing the nation-wide interest that achieved the goal.

Only the voice of aroused public opinion has defeated innumerable attacks on our natural wonderlands. It is urgent that everyone who appreciates his Parks join forces with the organizations that are working to safeguard them.

FRED M. PACKARD,
Executive Secretary

National Parks Association,
Washington, D. C.

Sirs:

Just a word of very deep appreciation for Mr. Weldon F. Heald's "Shall We Auction Olympic National Park?" It is a most convincing argument, muchly fortified by the excellent illustrations, of this never-ceasing fight to preserve the National Parks.

Mr. Heald's photograph of the Roosevelt elk recalls that the first of the three redwood groves I purchased and gave to the State of California Park Board (The Mary Glide Goethe Memorial Grove) was selected largely because the Roosevelt elk at the adjoining Orrick Meadow regularly forage into my Sweetheart's grove.

C. M. GOETHE

Sacramento, Calif.

Strange Antlers

Sirs:

Perhaps your experts at the American Museum can give me some information on the two strange deer heads shown in the accompanying photographs.

COY E. DILLARD

Rocksprings, Texas

The following comments are offered by George G. Goodwin of the Museum's Department of Mammalogy:

The first example represents a diseased condition where all resemblance to the normal growth of antlers has been lost. In the second case, the deer, owing to

continued on page 430



▲ TOO MUCH

▼ TOO MANY



NATURAL HISTORY

The Magazine of the American Museum of Natural History

Bringing you the best in scientific thought and opinion in exploration, research, and the world of nature

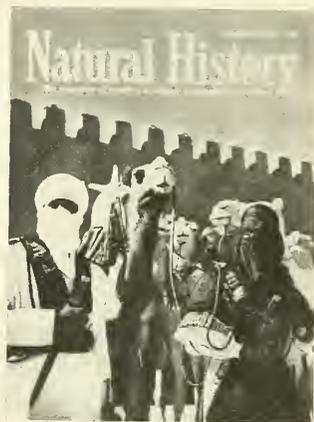
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November, 1954
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THE COVER THIS MONTH

These two men belong to the Tuareg tribe in which the men wear veils instead of the women. Both of them serve in the Desert Patrol. The man in blue belongs to the noble class, the other not.

The patrols go out for months at a time to police the oases and occasionally to search for lost travelers or to go to the rescue of a plane that has crashed in a remote area. A single French officer generally leads the Tuaregs and the accompanying group of legionnaires. He is called a *Meharist*, a *mehari* being a swift dromedary. He lives with his patrol and does everything they do, eating their food and living their nomadic life.

A headquarters for these patrols is Tamarassett, a small town in the heart of the Hoggar Mountains in the central Sahara. The Tuaregs know the desert better than anyone else in the world. Not long ago the Tuaregs and French fought each other, but the Tuaregs have been pacified and they perform an important service in these patrols. Their habit of covering the face is thought to have arisen as protection against the heat and dryness.

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Indians OF THE Plains

By **ROBERT H. LOWIE**

*Professor of Anthropology,
 University of California*

Foreword by HARRY L. SHAPIRO, Chairman, Department of Anthropology, American Museum of Natural History.

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McGraw-Hill Book Co., Inc., N.Y. 36

YOUR NEW BOOKS

Indians of the Great Plains • Zoo Expeditions
 Jungle Adventure • Before Everest • Puffins

INDIANS OF THE GREAT PLAINS

-----by Robert H. Lowie
 Anthropological Handbook Number One
 The American Museum of Natural History
 & McGraw-Hill Book Company, Inc., \$4.75
 222 pp., 105 illus.

SINCE the days of Lewis and Clark, the colorful Indians of the Great Plains of North America have fascinated the public of Europe and the Americas. In this beautifully organized and illustrated book, a leading authority on this culture area presents a vivid and accurate picture of Plains Indian life from the archaeological past into the acculturated present. But it is with the ethnology of the mid-nineteenth century that Dr. Lowie deals most fully and delightfully. As becomes a museum handbook, there is considerable emphasis on material culture and on the unique and varied arts of the region, supplemented by over one hundred maps, photographs, sketches, and reproductions from Bodmer and other classical artists of the Plains.

Such things as the relative recency of many tribes in the region and the marked changes brought by the acquisition of the horse make this a complicated story despite its seeming common factors. With a master's touch, Lowie in his chapters on Social Organization and Supernaturalism reveals the common warp as well as the varied woof strands that made the tapestry of Plains culture. The roles of the buffalo, maize, the horse, warfare, vision quest, and the more complex ceremonialism of the farming tribes are all touched upon, though the present reviewer might just suggest that the author is still a Crow at heart. This is a book for laymen and specialists alike. It incorporates new facts, new insights, and, above all, the richness that once characterized the "Buffalo Plains," giving that area a unique and durable place in the history of the American West.

WM. DUNCAN STRONG

PUFFINS

-----by R. M. Lockley
 The Devin-Adair Company, \$4.00
 186 pp., 25 illus.

THE British nature writer, R. M. Lockley, has long been a favorite of those who love the North Atlantic and its islands: dour and forbidding in winter but suddenly beautiful and exhilarating in

spring. Lockley combines the keen eye of a trained naturalist with the pen of a gifted writer. Some of his books, such as the one called *Shearwater*, are written more for the ornithologist; others, like *The Way to an Island or Letters from Skokholm*, are of wider literary interest. The present volume belongs primarily in the former category but like all of Lockley's works is well written from cover to cover. The book is based upon observations made during the many years he lived on Skokholm, Skomer, and other islands off the coast of Wales.

The puffin is a curious, colorful, and unusual member of that northern family of sea birds, the auks, which are the counterparts of the penguins of the Antarctic. Lockley traces the life of this peculiar sea fowl throughout the yearly cycle, beginning in winter when the puffins are widely dispersed over the stormy North Atlantic, riding out as best they can the cyclones that sweep across the ocean at that season, and passing on to their return, at the approach of spring, to the islands where each pair digs a deep burrow in the turf in which to lay the single white egg. Over 40 days pass before the chick emerges from the shell, and throughout its early existence it is beset by various enemies. Not the least of these, particularly in past years, was man, who caught both old and young for food. Indeed, one of the most interesting chapters in Lockley's book is a scholarly account of the puffin's relation to man, past and present, which runs the gamut from a life-giving source of food to a subject for parlor limericks. It is a pleasure to note that Lockley has enough readers in America to justify publishing the latest in his series of fine books in this country.

D. A.

FORERUNNERS TO EVEREST

-----by René Dittert,
 Gabriel Chevalley
 and Raymond Lambert
 (English version by Malcolm Barnes)
 Harper and Bros., \$4.00
 256 pp.; 1 color plate; 26 photos;
 6 maps; 3 sketches

IT is most fortunate that the great achievement of the British Everest Expedition of 1953 did not eclipse the superb efforts of the Swiss Expeditions, which came within a few hundred feet of conquering

continued on page 127

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by NORMAN D. FORD

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4 SPEAK - EASY (TIP-EASY, SAVE EASY). How do you order a meal in Paris? Tip a waiter in Rome? Get a haircut in Germany?

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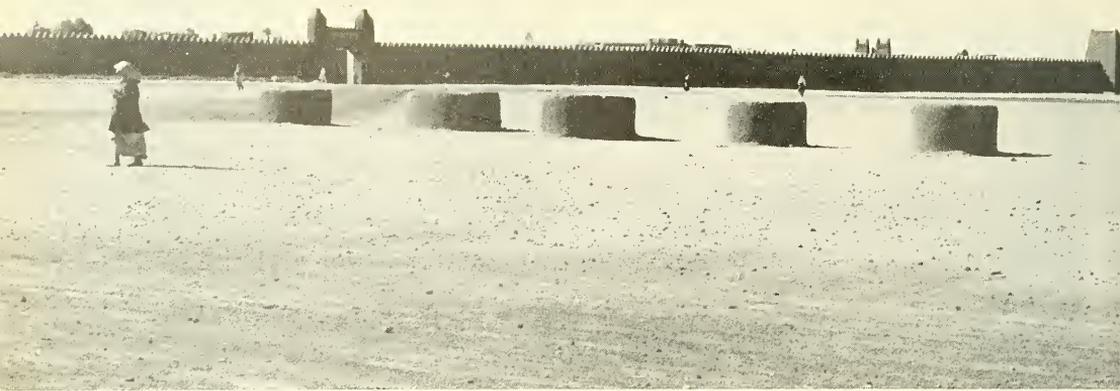
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Will the Sahara

A thousand miles of underground irrigation canals once nourished areas that are now desert. French scientists are endeavoring to bring prosperity back to the region through modern hydraulic engineering and better health and education for the inhabitants

WE thought at first it was a blowout, or worse. Perhaps a mainspring or even an axle had snapped in two, smack-bang in the middle of the Sahara Desert.

Our truck gave a sudden lurch and, after running on for a few feet, ground to a halt, still tilted at a bad angle. It was no place for an accident. The sand was deep and loose and was piled up in great dunes on all sides of us. A few sickly palm trees were scattered around. We jumped out of the truck fully expecting to find that the worst had happened.

As usual in Africa, we found the unexpected.

Instead of a broken mainspring or blowout, we found our truck had literally sprung a leak in the middle of the Sahara. Not a leak in the radiator hose or water jacket but a leak in the desert itself. The left rear tire of the truck had

broken through the sand and uncovered a little stream, which was sparkling in the sun.

By chance we had stumbled across—or into—what proved to be one of the most fascinating stories we uncovered in a 16,000-mile field trip through Africa. Our group was known as the Bernheim-Conant Expedition of the American Museum of Natural History, and our primary task was to come back with Kodachrome films and still color photographs of nomadic peoples of the desert. To get to these people in the Sahara, we had to cross an area known to French administrators of southern Algeria as the “Annexe du Touat,” a region of scattered oases some 600 miles long and in places 500 miles wide—all in all, an area about three-fifths the size of France itself. It runs from Beni Abbes, a village perched on the great dunes in the northern Sa-

hara, to Ksabit in the south, well on down toward the desert’s dramatic meeting with the waters of the Niger River.

We had the dry statistics of the Touat region well in mind before our expedition was outbound from New York for Casablanca last December. Although we had read everything at hand, it took that lucky break-through in the sand to plunge us into a story involving a bloody massacre in the same year that Christopher Columbus discovered America, as well as a race by geologists in search of oil and an all-out drive by French officials to keep the people of the Touat from disappearing from the face of the Sahara.

We saw these people closely for the first time when, shortly after our truck bogged down, a band of screaming, ragged children rounded the corner of one of the near-by



◀ AGRICULTURAL PROSPERITY long ago left the area, but the *foggaras* go marching on. Each of these circular objects is the top of a vertical well, leading down to a horizontal canal dug below the surface. One such *foggara* may extend for ten miles across the desert, marked by these shafts. In the background is the French Fort of Adrar. This is an administrative center for the *Touat*, a region three-fifths the size of France. The tire tracks are a clue to Adrar's future. It is now a halfway maintenance point for the heavy diesel trucks that have replaced the camel caravans crossing the desert

▼ **KHAID** of Tammentit, who holds absolute power over his village subjects. French administrators cultivate the confidence of the native leaders, whose co-operation will be needed in the program of social and economic reform

Loom again?

By

FRANCIS PAINE CONANT

Illustrated by photographs of the Bernheim-Conant Expedition



dunes and ran pell-mell toward the water that was bubbling free and clear in the middle of the desert. By the time the children got to the break, the four-wheel drive of our Dodge "Power Wagon" had pulled us out of the stream. From a little distance, we watched the children—some of them naked, others draped in rags—repair the damage with wet sand. They first built a cover for the stream and then scattered dry sand over all. Except for their footprints, there remained no clue to show that under the hot, bright surface there ran a stream of pure, cold water.

Their work done, the children quickly ran away, back behind the dune from which they had appeared. We correctly guessed that just on the other side must be an oasis village. On our return to Adrar, the administrative center of the Touat, we learned that the village was just one of many, and that we were lucky only to have broken through to just a little stream. We might have plunged as much as 50 feet to the bottom of an intricate underground system of horizontal wells built many years ago by the people of the Touat in the heyday of their prosperity.

We found out that these horizontal wells, known as *foggaras*, bear silent testimony to the fertility of the desert in centuries long since passed. The *foggaras*, like the pyramids of Egypt, are also a cruel reminder of slavery. The manpower needed to build the tunnels must have been tremendous and could only have been supplied in a slave economy. Thousands of men must have toiled for years in building the *foggaras*, which were dug under the surface of the Sahara without the use of any shafting or interior supports. *Foggaras* up to ten miles in length have been found. All in all, there are in the Touat area about 1000 miles of them, turning and twisting below the desert's surface to the exact spot where their architects calculated the water table could be tapped to bring life-giving moisture to the gardens and palmeries.



▲ THE ANCIENT IRRIGATION SYSTEM fell into disrepair centuries ago, and what water there is is measured out by crude dams like the one shown here. The water flows from lower left toward the small mud dyke in the center. The owner of the water punches holes in the dyke for each customer, according to how much he can afford to pay. Beyond the dyke, the water is led by tiny canals to the customers' gardens. In the photograph, Lieut. Mielot, a French administrator, is explaining the system to the author's wife.



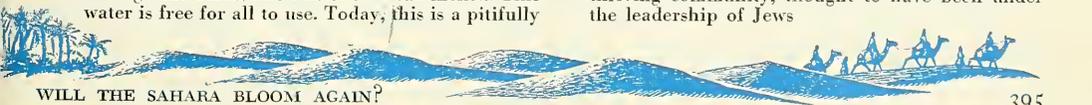
The technique for constructing the *foggaras* was much the same as that of a child digging tunnels on a sandy beach. Vertical wells were sunk as often as required and to the needed depth. From the bottom of each hole, slaves would dig horizontally until a meeting was effected with another team of diggers, working in the opposite direction from the next hole in line. Sometimes the diggers would miss and be forced to excavate at an angle to meet the next tunnel. Standing on the top of a dune, or from any other elevated position such as a rooftop, we could see the crumbling tops of the *foggara* well shafts marching across the desert in a straight line but with an occasional zigzag where the diggers had missed.

Despite the breakdown of the society that produced them, some of the *foggaras* are still working, as we learned when our six-ton Dodge caved in the surface of the desert. Actually, we had not broken through a *foggara* but a canal leading from a reservoir fed by a *foggara*. Like the one we "discovered," some of these canals are buried just under the surface. Others are on top, but all of them lead from the reservoir to the village gardens. As we were to see when inspecting the Touat villages, these canals remind one of nothing so much as an extensive model railroad display. Some of the canals are only an inch wide and an inch deep. They circuit around houses, through fences, and across other canals by means of little bridges and tunnels.



▲ LARGER IRRIGATION CANALS often wind their way through the oases, like this one in Tamentit. This water is free for all to use. Today, this is a pitifully

poor village, but before 1492 it was the center of a thriving community, thought to have been under the leadership of Jews

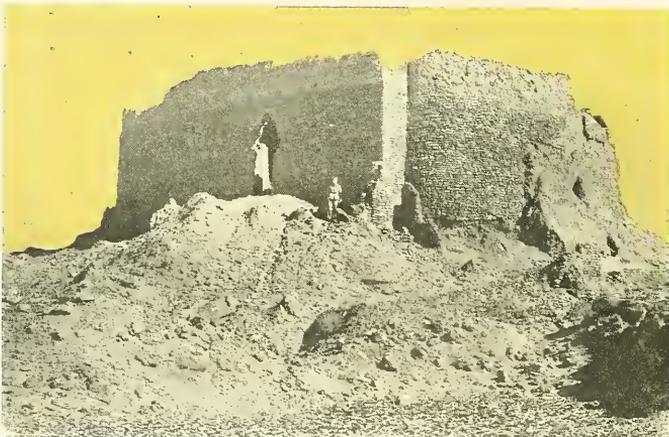




▲ Loom-work is about the only handicraft left to the village inhabitants of the Touat area of the Sahara. At one time the oases were important centers of trade and commerce along the ancient caravan route



▲ WOMAN'S LOT is the hardest in the desert. For the most part, the men sit around and wait for the crops to grow so that they can sell them. This woman tends the gardens, raises the children, and does the cooking—with little or no reward. She goes unveiled because she belongs to the lower classes. She may be the descendant of a former Negro slave



▲ In 1492, Moslems are believed to have killed the last Jew in the Touat and raised a monument to the man who did it. The ruin shown here is believed to be one of the few Jewish buildings to have escaped complete destruction. It and others like it are built of un-mortared stone instead of the more familiar sun-dried brick. They are also above the level of the present buildings. They may have been built on the shore of a lake several hundred miles long that was taken over by the desert

However, in some villages—largely deserted—the canals are dry and the banks have crumbled away. Most often, the foggaras feeding the central reservoir have been put out of action by sandstorms, cave-ins, and shifts in the underground water table. There is no labor force in the Touat today large enough to keep them in working condition.

The question we asked ourselves was: Why? Why had the society that produced the foggaras fallen into such lean years that their very means of existence had disintegrated? What had happened?

Lieutenant Roger Miclot supplied us with an answer. We had met Miclot soon after our arrival in Adrar, where he was living with his wife and infant child. In a small administrative center like Adrar, miles from any place in particular, people get to know each other quickly; and we soon were talking



▲ **TOMB** of an oasis townsman. This mud brick structure was built at least a century ago to a man who made the pilgrimage to Mecca and became a minor prophet. It is now a holy place where faithful Moslems go to worship

with Miclot about the Touat area. Being an administrative officer, he is in the French Army, but, like his fellow officers, he is hardly a model of the spit-and-polish soldier. He is, in fact, a professional pioneer, by chance wearing a uniform. The young lieutenant had taken time from his official duties to make quite a study of Touat history. His theories, although inconclusive as yet, have helped unfold the story of these oasis people.

According to Miclot, the year 1492, familiar to American school children as the beginning date of North American history, marks the dramatic ending of a period of great prosperity in the Touat. Miclot has been led to believe by a study of old Arab chronicles that the persons responsible for the wealth and growth of the Touat were Jews. The theory goes that the Jews fled the country of Cyrenaica in North

Africa during the time of violence under the Roman Emperor Trajan (A.D. 98-117). Somehow the displaced Jews found their way south through the Sahara to the Touat region, and from the second to the ninth centuries, Miclot believes, the whole area came more and more under the leadership of these Hebrew peoples, who carefully nourished the desert and its trade routes to produce a prosperous and thriving enterprise. Dates harvested from the palmeries of the Touat may have been exchanged for the products of the south: grains, fats, cattle, and salt. The trade link continued northward and by devious means reached the populated areas on the shores of the Mediterranean. Miclot theorizes that at the time of this prosperity the population of the Touat was basically Berber, or Hamitic. It appears to Miclot that the Berbers and the Jews lived

peacefully together for many hundreds of years, at least until the tenth century.

Then, the story is told of how the so-called Arabo-Berbers began arriving from the north. The great Moorish empire had swept across the Mediterranean coast in the Middle Ages, and the Berbers became Islamized. They absorbed much of the religious fanaticism of their conquerors and carried their new-found zeal to the Touat. From the tenth to the fifteenth centuries, it seems that more and more of these Islamized Berbers settled in the Touat, and where no friction apparently had existed before, sharp conflicts arose between the Jewish and Moslem faithful.

For a considerable period of time a compromise seems to have been worked out between the two groups. The Jews were in the position of a leading minority and apparently



▲ THE THREE R'S, Koranic-fashion. Each child holds a heavy stone tablet on which are written verses of the Koran in Arabic, which they will learn by recitation and repetition. Chances are that a pupil will never learn to read his tablet but only to recite the verses by heart. French administrators are offering modern education for those who want it, leading even to the Sorbonne in Paris



were forced to pay tribute to the numerically superior Moslems. But as time wore on toward the close of the fifteenth century, it seems that the compromise became unacceptable, and religious and economic issues in the remote oases were made an excuse for a vicious pogrom against the Jews. It was in the year 1492, Miclot believes, that the leaders of the Moslems of the Touat took sword in hand and determined to win once and for all the prosperity of the area for the members of their own faith. At that time, the Jewish center of the Touat appears to have been Tammentit, a pitifully poor village today but then a busy center of trade and commerce. The Moslem swords flashed. Men, women, and children were run to earth, and their very homes were leveled to the ground. When the bloody business was over, the entire Jewish population of Tammentit had been wiped out. In their awful zeal, the Moslem

rulers are said to have erected a monument to the memory of the Arab who killed the last Jew.

Once established in their new position of absolute power, the Moslem masters eagerly set about carving the prosperous trade routes into little kingdoms. Jealous rivalries apparently blossomed into little wars. Nowhere was there peace, and the trade caravans fell victim to brigandage. A period of decadence set in, which lasted for nearly five centuries and for which only now, thanks to the energy and vision of the French, is there a possible end.

We watched this program in action and went with French doctors — army doctors — on their rounds through the Touat villages. It was a good way to see the people and learn how they lived from day to day, with no “show” put on for the unexpected visitors. We were to learn more of the French program later, and of its immediacy, after we

became familiar with the oases and their problems.

Early in our stay at Adrar, we ventured across the flat, gravel surface of the desert to see for ourselves what are supposed to be the only surviving ruins of the Jewish inhabitants of the Touat. These ruins apparently escaped demolition by the Moslems in 1492. Unlike the adobe-style homes the Arabs have traditionally built for themselves, the ruins are built of rough rock, mortared together and based on a foundation of stone. Furthermore, the ruins are circular, as if the homes had been built in the shape of towers, possibly with a flat roof.

There is another striking feature: the ruins are considerably above the level of the oldest Arab-style homes in the oasis. This is a clue that Lieutenant Miclot cites to bear out another theory he has been led to believe. He has found mention of the existence and disappearance of a large lake, at least several hundred miles long though perhaps quite narrow, which may have contributed to the prosperity of the Touat by serving as a link in the desert trade routes prior to 1492. Proof or disproof of the lake's existence must rest upon the findings of trained physiographers charting evidence of ancient beaches and of archaeologists excavating village sites that may have existed along them.

After living in the area, one can have no doubt that in the fairly recent past and much earlier the Sahara must have been a vastly different place than it is now. The French Government's Hydraulic Service bases one of its representatives, Robert Orenge, in Adrar. Like Miclot, Orenge lives with his family in the administrative center but spends much of his time out in the desert, pursuing geological studies and visiting oases in need of his advice on water problems.

Orenge's lonely desert travels force him to provide his own amusements, and he has made a hobby of charting prehistoric camp sites, which are littered with ar-

rowheads, bone needles, and bits of ostrich eggshells that have been pierced and rounded, apparently to be strung and worn as jewelry. The abundance of shell fragments shows that ostriches must have once existed in great numbers, and this means that there must have been some kind of supporting vegetation. The vegetation in turn means that the climate at one time was very different from today. This is borne out by another set of charts made by Orengo as part of his official duties: charts of salt beds, apparently the residue of former lakes.

Strangely enough, getting rid of water takes up as much of Orengo's time as does finding new sources of uncontaminated water for the oases. Orengo was glad to have us go with him to relieve the monotony of his inspection tours. He showed us how he channeled bad water, loaded with mineral salts, away from the oasis gardens and into the shallow depressions of former lakes. The borders and sometimes the bottoms of these depressions are blazing white because of the old deposits of salt.

The apathy of the Touat people is one of Orengo's constant headaches, and he has to devote a large



▲ THE NEW MEDICAL SERVICE spells out good health for many of the 40,000 residents of the Touat. The 60-bed hospital is under the command of Major René Joseph, with Lieutenant Jean Louis Dieterlen as his second-in-command. These Arabs waiting outside the hospital will soon get their antituberculosis shots

◀ IN THEIR FIGHT against tuberculosis, the French doctors and nurses met opposition from Moslem husbands who objected to having their veiled wives uncover their arms to be vaccinated. Male members of the expedition were not permitted to see this procedure, which was successfully carried out only after the doctors had used every means of persuasion. Ancient custom hampers the scientists, who are pledged to bring the benefits of modern science to a decadent region

part of his time to winning the confidence of the village leaders, or *Khaid*s, and securing their approval for new wells or drainage ditches. Old foggaras long out of use as water conduits are sometimes a favorite resting place for the villagers seeking shade from the blistering heat of the desert summers. In the foggara tunnels, the temperature rarely varies far from the 70-degree mark. Sometimes on a surprise visit, Orengo will find the village goats enjoying a feast in the gardens and the entire oasis seemingly deserted. The first place to look is in an old foggara, and more than once Orengo has found the population contentedly squatting and sleeping below ground. Some of the foggara tunnels are quite high and broad, in places at least ten feet in width and also in height from the sandy floor to the vaulted ceiling overhead. The periodic vertical shafts provide plenty of ventilation, and strong drafts of air sweep the length of the tunnels.

The Arabic word for river bed is *oued*, and the foggaras, when in use, actually become the beds of underground rivers. Having heard of the early history of the Touat from Mielot, my wife and I were not particularly in sympathy with the plight of the present-day inhabitants of the Touat. Orengo is fond of jokes and does not mind bad puns, so after telling us about the villagers living in the foggaras, we expressed our feelings by saying, "They've made their *oued*; why not let them lie in it?"

Orengo shot back, "When you get to know these people, you will like them." And it was true. The people are fiercely independent, hospitable and proud but desperately poor.

➤ **HYDRAULIC ENGINEERS** have put up this test pump in a program aimed to replace the ancient irrigation system with modern machinery. Weather conditions near Adrar make possible the use of wind power

At one time we offered a cigarette to an Arab of the aristocratic, land-owning class. He accepted the offer—and a light. A minute later, he offered the palm of his hand so that his guests need not flick their ashes into the sand.

French administrators took over in the Touat in 1901 and quickly abolished slavery, but the oasis people still divide themselves into three classes: landowners, laborers who have earned their freedom, and those still tied to the land, in effect slaves. Orengo told us that these social divisions are so strong that even if a villager finds work in the administrative center of Adrar, for example, he must kick back a good percentage of his wages to his oasis *Khaid* simply for the privilege of working away from the village.

A small but significant number of villagers from the "slave" class are leaving the oases in search of better lives elsewhere, more often than not in the north. Discoveries of mineral sources have led to the development of Colomb-Bechar as a new industrial center, right on the edge of the desert.

We saw for ourselves that these mineral discoveries are by no means limited to the north. One morning in Adrar we woke up to

find several "out-of-town" trucks parked in the dusty, wind-swept square of the village. Some of the trucks belonged to the Shell Oil Company, others to the American firm, Caltex. Personnel of both companies refused to have anything to do with each other, and the next morning the trucks had gone their separate ways across the desert in a race to plot out likely oil fields in the Sahara.

French administrators began their drive to rehabilitate the Touat long before there was any concrete evidence of underground riches in the area. For many years the French have shipped food to the Touat to supplement the meager crops grown in the oases. Now that emigration from the Touat has increased, the problem of labor supply has become all the more critical. There are not enough people to work in the gardens, and for many years (since the supply of slaves was cut off) there have not been nearly enough workers to keep the system of foggaras in working order.

The foggaras that still do work provide a monopoly source of income for the aristocratic Arabs who own them. The foggaras are led to a reservoir which is dammed at one end. For a certain price, small holes





▲ THE CAMEL, symbol of the desert through the centuries, may be put out to pasture if modern technical developments can revive the trade routes, disrupted long ago by petty wars and selfish interests.

are punched in one end of the dam to let out a quota of water. The amount of water depends on the size of the hole, and the diameter of the hole itself is determined by how much the customer can afford to pay.

Orengo is in charge of a French experiment to replace the foggaras with wind-driven pumps. A pilot pump has been installed near Adrar, and the newly irrigated land is being awarded directly to the workers. If the pumps become popular they will do much to better the lot of the Touat people.

This program of betterment can ultimately benefit France by increasing the store of goodwill in the Sahara. Mineral and oil discoveries seem certain, and French investments of men and money need not suffer the same fate as the British have in perfecting the Iranian oil fields.

For once, social development has a lead on technical improvement. But the race for new mineral and oil sources has begun in the Sahara, and the new-found riches could gravitate into the hands of

the few, leaving the many dissatisfied. The social work being done by the French in the Touat can help eliminate this possibility, despite the difficulty of working within a society such as the Touat's, wherein the customs and practices have been hardened by centuries of isolation and stagnation.

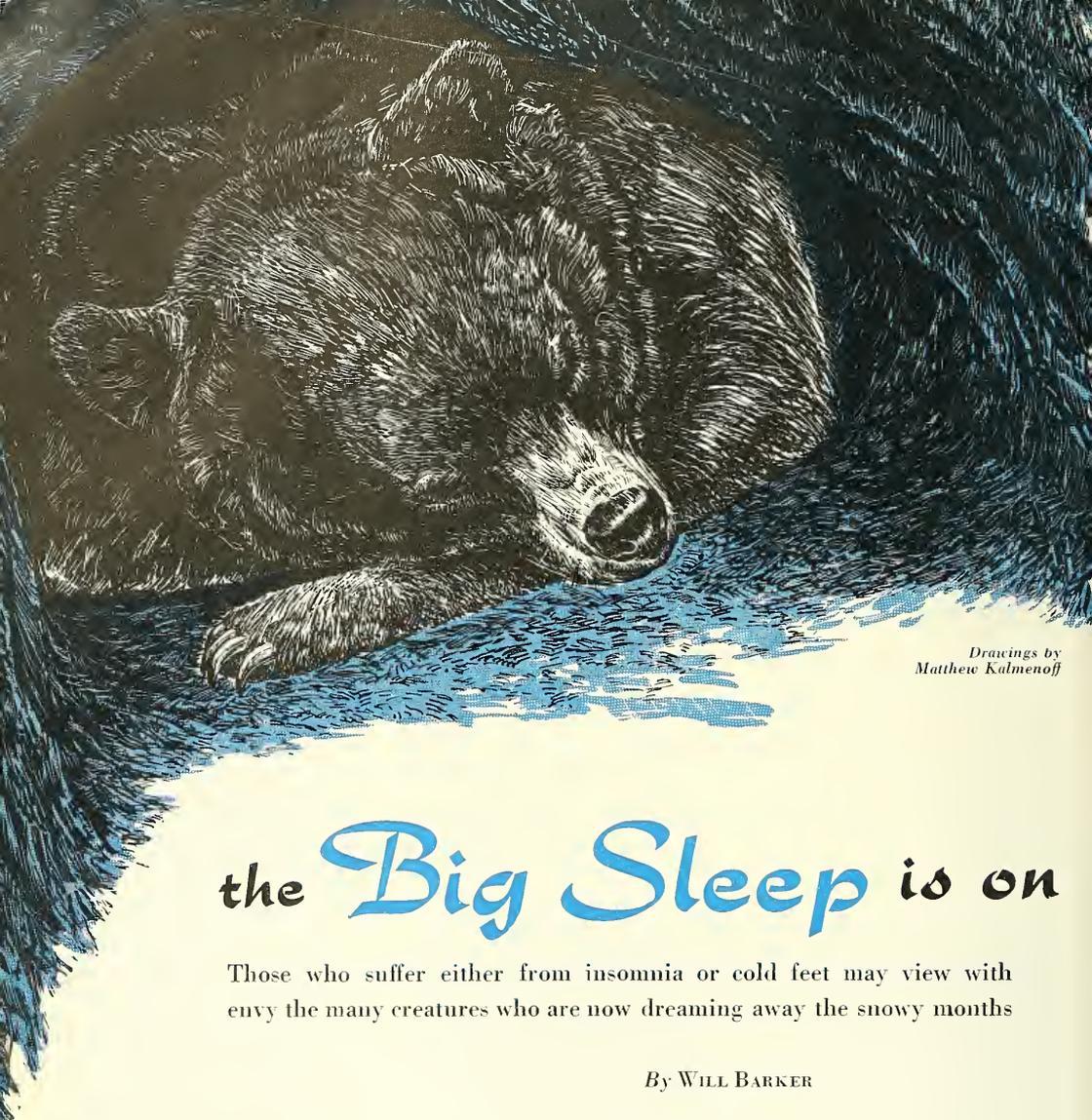
We saw at firsthand the hardships these customs work when we accompanied Lieutenant Jean Dieterlen, a French army doctor, on his rounds of the Touat villages. Dieterlen, second in command of the hospital at Adrar, was helping supervise an intensive antituberculosis campaign.

To make the campaign successful, the exact population of the Touat had to be known. A final figure of 38,000 was arrived at only after much persistence and cross-checking. In the Touat oases, fathers would count only their sons when asked how many children they had. In the Touat's Moslem world, little girls count for nothing. Wives, too, are hardly worth mentioning. It was only by the utmost tact that the husbands could be

persuaded to bring forward their veiled wives for the preventive injections. Dieterlen himself was allowed to supervise the injections only because of his personal friendship with the Arab husbands. Only the female members of our expedition were allowed to watch the procedure; the male half was barred from the village. However, our still and movie cameras were able to get some rare records of the Arab women fighting against unveiling an arm for the doctor's needle. Some of the women had been so carefully cloistered that they thought our cameras were part of the operation, and would wait in front of the lens, fearful of another needle.

Although the class system is essentially feudal in the Touat, as well as being extremely rigid, there has been throughout the centuries a general melting of races and religions. Some of the women seen briefly during the antituberculosis campaign were obviously Negroes, whose ancestry no doubt went back to the former slave days. However, the Moslem custom of permitting one man to have more than one

continued on page 432



Drawings by
Matthew Kalmenoff

the *Big Sleep* is on

Those who suffer either from insomnia or cold feet may view with envy the many creatures who are now dreaming away the snowy months

By WILL BARKER

NOW it's the time of the big sleep for the bees, the bears, and even the buds of the plants that shed their leaves. And the intensity of this winter sleep, or hibernation, depends on who's doing it.

The big sleep of the bears, for instance, would probably be considered a mighty severe case of insomnia by the woodchuck. The woodchuck goes in for sleeping in a big way and often puts in a solid

six months of it—almost double the time the black bear spends in drowsing the winter days away.

In the North, the woodchuck goes below decks earlier than his kinfolk in the Deep South. In the Province of Quebec it may be the middle of September, long before Squaw Winter has warned that the real thing is on the way. The woodchuck settles down either in a grass bed at the end of his tunnel or in an unlined side chamber. He

has an effective way of saying "Do Not Disturb" to the opossums, skunks, or rattlesnakes that would like to share his snug winter quarters. He buries himself alive by sealing off his sleeping chambers with dirt scraped from the far end of the room. Then he's as safe from unwelcome visitors as a hotel guest who's put a DO NOT DISTURB sign on his door. Once privacy has been ensured, the woodchuck rolls up in a ball, head between his hind legs.

Breathing slows down until it almost stops, and the pulse becomes faint. The animal gets colder and colder until finally his temperature drops to somewhere between 40 and 57 degrees Fahrenheit. Now the woodchuck is in true hibernation, insensible to touch or sound, his biological fires banked.

Ground squirrels, bats and badgers, snakes and turtles, frogs and salamanders, mosquitoes, spiders, crayfish, and even worms drop into this long-lasting and deathlike sleep, during which they live off accumulated fat. So anesthetized are they that they scarcely bleed, even if a limb is amputated. A ground squirrel dug out of a burrow remains as limp and inert as if its neck were broken. Insensitive as an Indian fakir on his bed of spikes, it can be shaken, dropped on a table, and even used as a pin-cushion. Revival is a slow process requiring prolonged exposure to heat.

The winter sleep of a bear, on the other hand, may be only fitful, and his body temperature doesn't nose-dive when he beds down. It stays high enough to melt any snow drifting into his hideout—cave, windfall, or swampy thicket. Because of this and because his breathing stays at a normal rate (four or five times a minute), the bear's big sleep is not considered true hibernation.

A bear is easily roused from his winter nap. He may even wake up of his own accord and come out of his chosen haven to prow around for a few hours, days, or even longer. Bears that do this winter-walking are often ones on the slim side. It's the bruins bulging with fat who den up early and sleep the winter through. Hunters have learned through dressing fat bears killed at the beginning of winter that the stomach is empty and shrunken into a tight, hard knot, which prevents eating anything more. Apparently when a bear reaches a certain state of fatness, this contraction of the stomach acts as an automatic food shut-off, and he is ready for sleep.

Polar bears flout the conventional attitude toward the big sleep taken by blacks, browns, and grizzlies, all meat-eaters who like an occasional mess of greens, berries, or comb of wild honey. In a polar-bear family only the expectant mother hibernates. She settles down early in the winter, and during her dormant period gives birth to twin cubs. And since only expectant mothers hibernate, it looks as if the polar bears' reactionary attitude toward hibernation contradicts two theories about it: one, that bears hibernate because of cold weather, the other that they hibernate because of food shortages.

Captive bears also contradict these theories. A New Hampshire farmer and amateur naturalist kept a pair of black bears in a well-built barn. Naturally the bears were sure of food and warmth throughout the seasons. But in the fall they buried themselves in straw, with only their ears sticking out. Paws were wrapped around their heads, which were dropped down and forward. If spoken to, the bears poked their heads out of the straw, looked momentarily interested, yawned, and then snuggled down again.

A certain amount of body conditioning goes into a bear's preparation for the long winter nap. Guides on Kodiak Island, Alaska, home of the great Kodiak Brownies, say that just before the bears go into their kind of hibernation, they gorge themselves on wild cranberries, which act as a purge.

For the entrée of this prehibernation dinner, the bears eat fibrous roots. These form a tough plug, the so-called tappen, which remains in the bear's system until the end of the big sleep the following spring. Black bears in Minnesota have plugs composed of pine needles and hair apparently licked from their own coats. According to some hunters, the completeness of this plug determines the completeness of the winter's sleep.

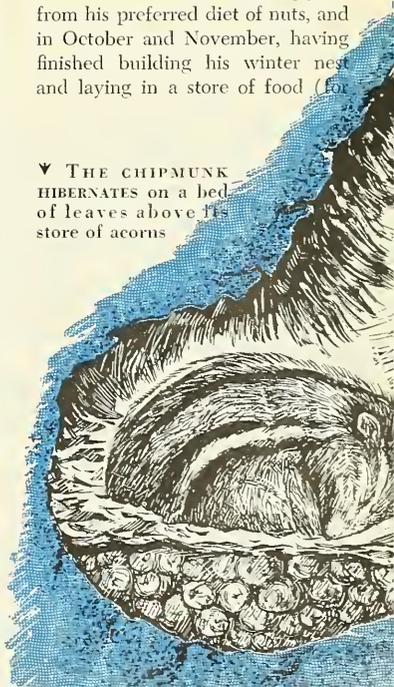
Many vertebrates other than woodchucks and bears indulge in

the big sleep, and the range of hibernation is great. Bats spice their lives with a varied hibernation pattern. The kind known as Leisler's bat sleeps continuously, while the pipistrelle, pale yellowish brown and weighing less than an ounce, is an intermittent sleeper.

One of the most eccentric of the true hibernators ever watched was a common hedgehog, an insect-eater of the Old World. This particular hedgehog was Irish and as full of surprises as most sons of Erin. It roused from its deep winter sleep only on the coldest nights. These highly unorthodox appearances decreased progressively until February, when the hedgehog stayed put until spring.

The dormouse is notorious for its urge to sleep. In fact, the first syllable of its name seems to come from the French word *dormir*, "to sleep." Lewis Carroll described it well in *Alice In Wonderland*, for all through the tea party, the dormouse yawned and rubbed his eyes, and dropped off to sleep from time to time. This habit so annoyed the Mad Hatter and the March hare that they tried to stuff the sleeper into the teapot to wake him up. By late September, the dormouse becomes exceedingly fat from his preferred diet of nuts, and in October and November, having finished building his winter nest and laying in a store of food (for

▼ THE CHIPMUNK HIBERNATES ON A bed of leaves above its store of acorns



a snack in case of a highly improbable wakeful interval), he settles down for a long winter nap, which may last six months. The breathing of a dormant dormouse can hardly be noticed, and he becomes so rigid that he can be rolled across a table like a ball. One can be aroused in about 20 minutes, but if the awakening is by too rapid exposure to heat, death follows almost at once. Certain African dormice *only* hibernate when brought to Europe.

A big sleep is the rule for reptiles in temperate climates. Land tortoises bury themselves in burrows or dens; water tortoises in the mud on the banks of streams and the bottoms of ponds. Many snakes and lizards go into hibernation by retiring underground, digging into the soil even though they may not ordinarily be given to burrowing. Some find seclusion in crevices in the rocks.

Most amphibians — frogs, toads, newts, and salamanders — seek moist places in which to retire, some of them underground, some of them, like the California arboreal salamander, in the cavities of wood. Common toads kept in a greenhouse will remain active throughout the winter but take time off for an occasional nap of a few weeks, showing that they need complete rest from time to time even when seasonal conditions do not demand it.

Some invertebrates hibernate, too. The forest, a noisy place in summer, is lacking in sound in winter because the noisemakers are deep in sleep. The young queen bumblebee may lie hidden in the mossy bank of a stream whose gurgle is silenced by a sheet of ice. During brief cold (or very hot spells), trap-door spiders seal their burrows with silk and mud, but it can scarcely be called true hibernation. Certain other spiders attach silken shelters to the under sides of rocks and remain in them as long as the cold prevents activity. Some mosquitoes in temperate regions pass the winter in caves like bats and live off the fat stored in their bod-

ies. Hibernating females have lived more than two months without food in caves where temperatures were in the fifties.

Land snails like the big sleep, too. The common garden snail hides himself in some cozy cranny late in autumn and doesn't come out until the spring sunshine has warmed things up a bit. Other snails batten down for winter under stones or dead leaves or bury themselves in fissures in rocks or in the earth. All shut the shell by a disc that fits as closely and tightly as a manhole cover and keeps out the cold.

Many fresh-water fishes hibernate in the temperate zone. Whole schools of carp, for example, retire to the muddy bottom and remain partially buried and dormant until the thaw. It has been found that the body temperature of a carp can go down to almost one degree centigrade below freezing before the fish is frozen to death. At the freezing point of water, the fish may appear dead, because its respiratory movement has ceased and it is in a state of torpor. But experiments have shown that the fish can be kept in this state many days and be revived quickly when the temperature is raised. Following this article, the reader will see some photographs showing tests being made in Denmark to perfect a method of "freezing fish alive" in order to ship them to far markets.

Among hibernators, of course, there are records. A mother bear and her three cubs stayed in a den for three and a half months. The all-time high in hibernation was chalked up by a young female ground squirrel. She slept for 33 weeks out of the year, thus outclassing all other mammals in the sleep marathon.

Not all animals hibernate. Instead of sleeping in winter, some animals estivate, or pass the summer in sleep. The tenrec, a Madagascar mammal with a fondness for earthworms, takes a long summer siesta during the hottest weeks of the year when earthworms are in short supply. Tenrecs in the London

Zoo behaved just as if they were at home, though there was neither a heat wave nor lack of food.

Estivation is forced upon some fishes and reptiles by the drying up of water. Crocodiles and alligators bury themselves in the mud until heavy rains release them. The Iberian water tortoise retreats under a ledge of rocks during a dry spell and stays there—a torpid tortoise for months on end.

A fish that goes for summer sleep in a big way is the African lungfish, a swamp-dweller. As the swamps dry up, the lungfish takes itself out of circulation until the next rainy season. It dives down into the mud for about 18 inches. Then it bends its body around until its tail covers its head. A layer of mucus exuded from the skin forms a lining around the flask-shaped bottom of the burrow and envelops the fish's body. Around the lips the mucus forms a tubular funnel leading to the mouth. This lets air pass to the lungs. Thus set, and with extra rolls of fat for nourishment, the lungfish passes into a state of suspended animation. Other fishes that estivate are the Indian climbing perch, the gouramis of southeastern Asia and Malaya, the Indian "serpent heads," and some catfishes.

While certain land snails hibernate, there are others that estivate. Egyptian desert snails can withstand a prolonged summer sleep, and one was an estivator of such endurance that it confounded the staid British Museum staff. Assuming that the shell of an Egyptian land snail was empty, a museum worker attached it to an identification card in March, 1846. Four years later in March, 1850, traces of slime were noted on the card. It was immediately put in water, and when the shell came off the card the animal crawled out.

The estivating and hibernating habits of plants are more like those of cold-blooded animals than those of bears and the like. Plants are affected by temperatures too low for the normal life processes and also by loss of water through tran-

spiration. Winter is a period when running or unfrozen water is hard to come by. Perennial plants are adapted to such seasonal changes by the leaf-shedding habit and by the sealing of dormant tissues. This same mechanism is used by plants in hot dry periods in the tropics.

We do not usually think of hibernation in connection with birds. But there are three reports to indicate that the poorwill is trying to get into the hibernation act. This character of our Western states has suspended its animation to a point

where the heartbeat could not be detected and no moisture could be noted on a cold mirror placed in front of the nostrils. Strong light beamed at the pupils of its eyes brought no response, not even an attempt to close the eyelids. So, by all conventional standards, the poorwill can participate in the deep sleep of winter. Instead of doing what any right-thinking bird would do, it seems inclined to escape the tiresome trip south on crowded flyways. And it must have been ignoring the traditional migratory pat-

tern of other birds for a long time, because the Hopi Indians call the poorwill "Holchko," the Sleeping One.

Right now, the big sleep is on for countless kinds of animals. In the hidden places where naturalists rarely see them, they are sleeping away the cold months with pulse and breathing near the vanishing point, while man, who has lost the knack of complete repose, lengthens his days artificially so that he can continue his frenetic activity, either at home or abroad.

Alive IN ICE

Danish scientists are perfecting a method of shipping fish long distances in a state of "enforced hibernation"

A Photo Feature by Mogens Amsnaes

from Black Star

MANY exporters of fish have dreamed of shipping their fish alive in tanks to all parts of the world so as to put them on the market fresh. However, this has been difficult and expensive, owing to the need of oxygenating the water and having someone in attendance. Arne Jøker of Esbjerg thought of shipping the fish in blocks of ice as though they were hibernating, and he had the persistence to experiment with the method. He is said to have gotten the idea from his mother, who had a pond of goldfish in her backyard. When

▼ MR. ARNE JØKER, cold fish expert, with wholesale dealer Sejerbo-Jensen, choosing a live cod from the bucket in Copenhagen for the tests in "suspended animation"



it froze solid, she expected all the goldfish to be dead; but she found all of them still alive when spring came. Her son pondered over the practical value of this power of fishes to survive surrounded by ice, and he came to grips with the potentialities when he aroused the interest of the manager of a firm called Cold Stores, one Mr. Möller, who placed rooms and staff at his disposal. One experiment followed another, with the result that they are now able to immobilize fish and revive them

29 days later. There is still a loss of 38 per cent. When a smaller loss can be maintained, living fish will be sent out in Danish refrigerator ships.

There is one difficulty, resulting from the fact that if fish are frozen solid, they cannot be revived. Apparently they remain unfrozen at temperatures slightly below the freezing point of the water around them, and in that condition remain torpid for some time.



▲ STILL ALIVE. the fish is brought to Cold Stores, where Mr. J. Fredskilde and Mr. Jöker anesthetize it

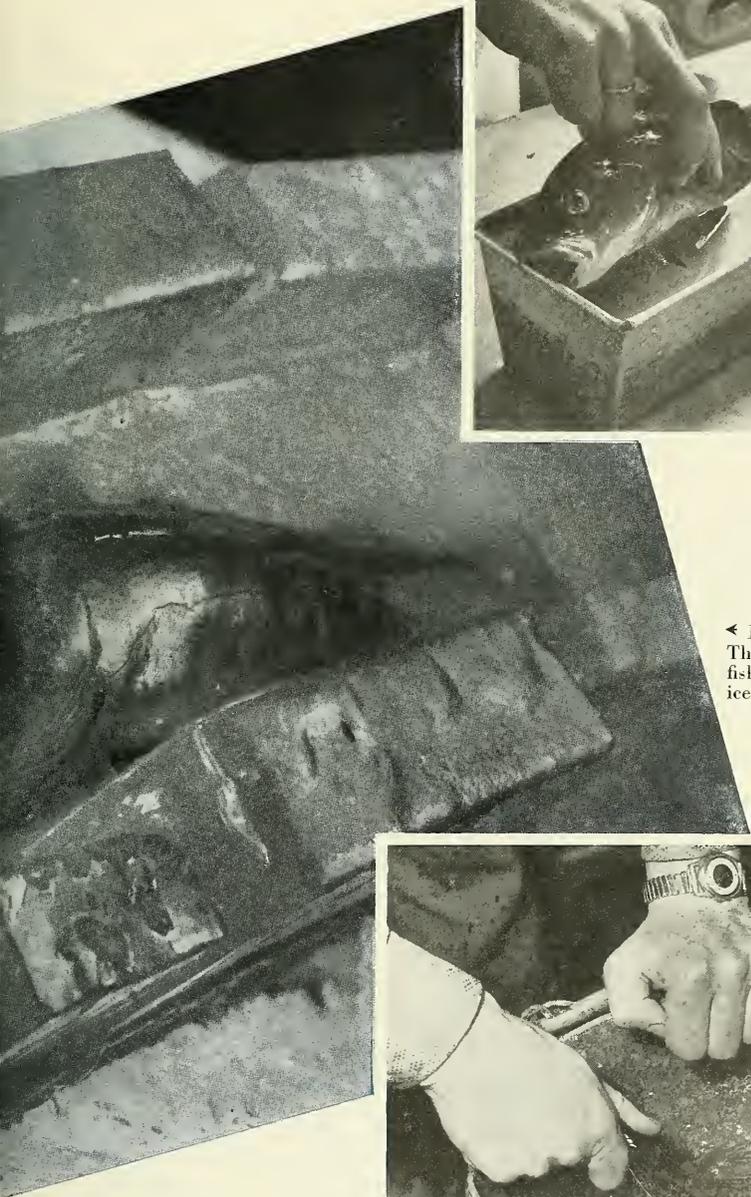
▼ THE INJECTION of Uhrtan and Evipan began to take effect within 30 to 40 seconds





▲ WHEN COMPLETELY ANESTHETIZED, the fish was put into water at about 7 or 8 degrees centigrade ($44\frac{1}{2}$ to $46\frac{1}{2}$ degrees Fahrenheit)

◀ NOW COMES THE SHOCK. The ice closes around the fish. It now has a shell of ice and is apparently dead



► IN BRINGING the fish back to life, the ice is placed in water at no more than 12 degrees C. (53.6 degrees F.). Slowly the organs begin to work again, and soon the fish has returned to its normal state





▲ **GEORGE CATLIN**: a self-portrait at the age of 28. He is described by a contemporary, Captain Mayne Reid, as having a figure well proportioned but not large and a handsome face, whose deep tan suggested the possibility that he may have been part Indian

AT the special exhibit of Catlin paintings held a short while ago in the National Museum, Washington, D. C., visitors were charmed by pictures showing Indian life in our West at a time when the frontier line was hardly beyond the Mississippi. Mandan bowl-shaped huts, Flathead squaws, U. S. Dragoons making friendly visits to Comanche villages, feats of Indian horsemanship, and other scenes were shown. All were painted by an artist whose love for America's red men caused him to leave the comforts of home and risk his life deep in the wilderness to record a culture he knew was vanishing from the earth.

With brush and palette, George Catlin visited most of the tribes between the Mississippi and the Pacific. Delving deep into the personality of his Indians, he placed on ice for posterity the life, habits, and customs of the red men at the time they were practically unchanged by the whites.

Catlin was born in Wilkes-Barre, Pennsylvania, July 26, 1796, and was educated for the law. He soon discovered, however, that his real talent lay in art, so he went to Philadelphia and set up shop as a miniature and portrait painter. Though he was self-taught, it wasn't long before his ability was acknowledged, and he was called upon

FRONTIER PAINTER

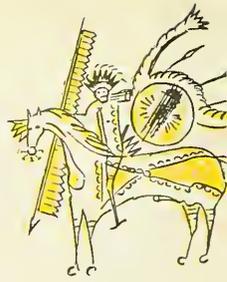
Explorer, artist, and student of man, George Catlin found adventures that today exist only in the uttermost parts of the earth

By **BATES M. STOVALL**

Illustrated from Catlin's sketches of Indian life in the American Museum of Natural History



◀ A VILLAGE of the Mandan tribe in what is now North Dakota. The earth lodges used by this tribe bear no resemblance to the skin tepees used by most of the Plains Indians, as shown below



▼ A COMANCHE VILLAGE by Catlin. This war-like tribe long blocked passage of the whites



▼ ALL COMANCHE YOUTHS could drop behind the horse for safety. The forward elbow rested in a loop braided into the horse's mane

to do portraits of General Winfield Scott and Governor DeWitt Clinton. Dolly Madison had her portrait done by him in Richmond.

Despite the recognition he received in Philadelphia and New York, his heart lay in the far-off tepee of the redskin. For when he was 34, he went to St. Louis to launch the mission to which he had dedicated his life. It was, as he put it, to place upon canvas "the noble races of red men, spread over these trackless forests and boundless prairies, melting away at the approach of civilization."

Many of the tribes visited by





Catlin are found today only in history books. One of them, the Mandan, a singular nation, was almost swept away by smallpox five years after the painter visited it.

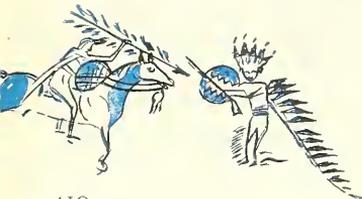
A Painful Test

Through the influence of James Kipp, a fur trader, and because the Mandans looked upon Catlin as a sort of medicine man, they let him sit in at their unique Okeepa rites. There he listened to weird music and watched horror-stricken, while young men were systematically tortured in the tribe's medicine lodge, to prove their manhood and to test their ability to endure the rigors of war. Besides enabling the chiefs to choose the best leader for future war parties, Catlin noted that the rites were performed in connection with certain religious observations. Slits were cut in the breast, or sometimes in the back, of each candidate who was willing. Wooden skewers were thrust through the openings and cords tied to them. After this, by means of the cords, the victim was hoisted into midair and left hanging. And then Catlin saw the stony-hearted attendants swing and twirl the limp, suspended bodies about, one of the torturers even sneering at his helpless victim as he did so.

Other slits were sliced in each man's shoulders and thighs. And upon the pins thrust through these openings were hung his quiver,

▲ OSCEOLA, the famous Seminole, who died five days after this picture was finished. Catlin's hundreds of drawings provide the only pictorial record of many things that vanished before the age of photographs

► WHILE young braves proved their fortitude by dangling from skewers thrust through their flesh, Catlin drew this picture in a Mandan hut



shield, or other similar equipment.

When a victim was so far gone that he dropped his medicine bag, he was let down. Here he was left until he recovered somewhat; then he was put through other tortures nearly as bad.

Catlin duly recorded the Okeepa for us, both in his paintings and writings.

Some persons refused to believe the artist had witnessed such bloody rites. The late Colonel D. D. Mitchell, Superintendent of Indian Affairs in Missouri and the Northwest, declared: "The scenes described by Mr. Catlin existed almost entirely in the fertile imagination of that gentleman." However, several people, including James Kipp, who had spent thirteen years with the Mandans and spoke their language, jumped to the artist's defense. It is now well established that Catlin faithfully portrayed what he saw. Indeed, self-torture was fairly common elsewhere in the Central Plains.

With the Seminoles

When Osceola, the Seminole, whose deeds were his press agent, was imprisoned in Fort Moultrie, near Charleston, Catlin lost no time in getting down there and preserving for future generations the likeness of the famous Indian and some of his tribe who were being held with him. Afflicted by a throat disease and refusing competent medical aid, Osceola died five days after his picture was finished.

Mocanopy, first chief of the tribe, was another Seminole held at Moultrie. Lusty and dignified, he refused to be painted, though he made quite a point of being present while others were posing for their portraits. However, he changed his tune on finding that the wine and whiskey that the artist adroitly had placed on display were only for those having their pictures done. So he put on a pair of beautiful red leggings and told Catlin that if he could make a fair likeness of his legs thus equipped, he would sit for his portrait. In order

to humor him, the painter completed the fellow's legs before doing the rest of his body.

During Catlin's evenings at Fort Moultrie, Osceola and other Seminole leaders gathered in his room to talk with him. His sympathetic interest led them to speak freely. They stayed until a late hour, railing at what they considered the treacherous means employed by the Government to capture them and asking him about conditions in the West, where they expected eventually to be sent.

One of the finest horses in the country was owned by Keokuk, the famous Sac Chief. When Catlin wanted to do his portrait, the Sac insisted he be painted mounted on his steed. This was done, but when the picture was exhibited in New York City, some of the critics scoffed: "No Indian ever had a horse like that one. It's not natural." Luckily for the artist, Keokuk himself arrived in the city about that time. The Chief hurried to the Stuyvesant Institute, where the picture and others were being exhibited, and emphatically told all present that the horse shown was exactly like the original. And he added: "If that horse hadn't been a fine one, Keokuk wouldn't have bought it."

Catlin was always the artist. While canoeing with an Army corporal on the upper Mississippi, he came opposite three Sioux teepees whose inhabitants beckoned him to land. When he refused, one of the Indians fired buckshot at the whites, splattering the water around the canoe and putting a hole through a cloak lying in front of the artist. The canoeists, their kettle of anger boiling over, made for the shore, while the Indians roared with laughter. But the triumph of the Sioux was short-lived, for Catlin and the officer landed and hurriedly cut them off from their lodges and from the gun, which they had now taken back to a teepee. Then, while the redskins were covered by the corporal, George Catlin, glaring down the barrel of his leveled musket with

bayonet attached, lined the rascals up and sketched each in succession. And as he painted them he sputtered: "I'm going to send your pictures to Major Taliaferro, your agent at Saint Peters, and tell him what you did."

Most Indians of importance whom Catlin met wanted their portraits done, despite warnings from their medicine men about the dire results that would follow, for to them, it made one man into two.

Half an Indian

Events seemed to bear out the medicine men in one case. Catlin, while in a Sioux village, was painting Little Bear, in profile or half face, when The Dog, a surly member of another band in the same tribe, scoffed: "Little Bear is but half a man."

"Who says that?" demanded Little Bear.

"The Dog says it and The Dog can prove it."

"Why does The Dog say it?"

"Ask the Painter; he can tell you; he knows you are but half a man; he has painted but half your face and knows the other half is good for nothing."

Promptly, as soon as Catlin had finished the picture, both men rushed to their lodges to get their guns.

Little Bear loaded his weapon, then threw himself on the ground and appealed to The Great Spirit for victory in the approaching duel. But while he was thus engaged, his wife, not knowing what it was all about and afraid he might do something evil, took the bullet out of his weapon.

Suddenly the voice of The Dog was heard. "If Little Bear be a whole man, let him come out and prove it. It is The Dog that calls him!"

Little Bear grabbed his gun and rushed through the door, followed by the piercing shrieks of his wife, who now realized what she had done.

Both men fired. The Dog was unhurt, but part of Little Bear's



▲ KEOKUK, a Sae chief. New York critics doubted he had such a fine horse, but Keokuk surprised everyone by speaking from the audience in defense of his steed



face—by a strange coincidence the side that Catlin had left out of the picture—was entirely shot away.

Catlin at once found himself in the midst of wild tumult. The Dog, joined by members of his band, fled, but was pursued by friends of the slain man. Guns flashed. A great many arrows flew through the air. The Dog was wounded in the arm but got away. Later, his brother, who had not taken sides in the matter, was killed in the white heat of tempers, simply because he was related to the slayer.

Afterward, the members of Little Bear's band decided that since The Dog had escaped, Catlin must die. For it was the white man's powerful medicine, they reasoned, that was to blame for their chief's death and also for the killing of The Dog's brother, a well-liked fellow, whose abrupt end was now regretted by all. Luckily for the artist, he was far away by this

time. Pursuit of The Dog continued, however, and he was finally killed near the Black Hills. This ended the danger to Catlin's life.

European Exhibits

Catlin's paintings, together with the Indian objects he collected, were known as his Indian Gallery. He exhibited it to large audiences in both the United States and Europe.

Today Europe is having a repeat showing of some of this artist's work; the 27 pictures displayed in the National Museum are being sent abroad by the U. S. Information Agency, and citizens of Germany, Austria, England, and France will be among those who view the paintings. And it is hoped that international goodwill will be furthered when these fine examples of our American heritage are seen.

Catlin often gave lectures in con-

nection with his exhibit. On the easel in front of him, he might put the portrait of Mint, a pretty little Mandan girl. "This little twelve-year-old girl," he would say, "has silvery gray hair, as you can see from the painting. The color of her hair is unaccountable for an Indian and is peculiar to the Mandans. About one of them in twelve, of both sexes and all ages, have it. Exceedingly coarse and harsh, the hair is somewhat like a horse's mane."

Then, perhaps, he'd place the portrait of One Horn on the easel, and the audience would be told: "One Horn was first chief of the Miniconjou Sioux. I painted his picture on the Upper Missouri in 1832. As you can see, he tied his hair in the form of a turban and filled it with glue and red earth, or vermilion. Unfortunately, about five years after I did his portrait, the chief lost his favorite wife

through sickness. His grief was such that, becoming reckless, he armed himself with a knife only and attacked a buffalo bull, which gored him to death."

Smithsonian Acquisition

Catlin's Indian Gallery eventually contained over 600 paintings. Queen Victoria of England and King Louis Philippe of France saw it in Europe, and buyers for it might have been found abroad, but the artist patriotically wanted his own country to have it. So he held off, hoping fervently that the United States Government would purchase it.

Acquisition of the Gallery in this country was strongly advocated by many persons, including eleven American artists in Paris, as well as Daniel Webster, who declared: "Their—the Indians'—likeness, manners, and customs are portrayed with more accuracy and truth in this collection by Catlin than in all the other drawings and representations on the face of the earth."

But though the House agreed to pay \$50,000 for the collection, the Senate by a majority of one vote

turned thumbs down on the project.

Eventually, financial disaster overtook the painter, and he lost his Indian Gallery to Joseph Harrison, an American, who saved it, however, for the United States by bringing it back to this country. After the death of Catlin and Harrison, the latter's widow and executors donated the collection to the Smithsonian Institution.

Not only financial reverses but tragedy as well overtook Catlin abroad. Both Clara, his wife, and George, his little son, died in Paris. Eventually his three daughters returned to the United States to live with his wife's wealthy relatives.

Alone now, his Indian Gallery gone and his finances a paltry heap in the bottom of the barrel, the artist squared his shoulders, tightened his lips, and made a series of trips to the Americas, where he sketched and painted Indians and nature scenes south to the Straits of Magellan and as far north as Alaska.

In the upper Amazon region, the painter had his usual trouble with medicine men. One of them told his fellow tribesmen that the white

man, through his pictures of them, was not only getting their skins but keeping their eyes open all night long as well. "This is a bad thing," concluded the hocus-pocus fellow.

Hearing him, the natives whose portraits had been done were terrified. Catlin had to act quickly. With a brush he strewed clay rapidly over the pictures and effectively hid the portraits. This satisfied everybody including the painter, for he knew that all he had to do to restore the portraits was to wash off the clay.

Cartoon Collection

The pictures painted on these trips to the Americas became part of what is known as Catlin's Cartoon Collection, which takes in some copies of his Indian Gallery paintings, his LaSalle paintings, and others. The LaSalle group, 27 in all, was ordered by Louis Philippe in commemoration of the famous French explorer. Unluckily for Catlin, the revolution that dethroned Louis ended all chances of payment.

Most of the Cartoon Collection is now in the possession of American Museum of Natural History in New York City.

George Catlin died December 23, 1872, from disease following exposure during an unusually warm summer in Washington, D. C., where he had been exhibiting his Cartoon Collection at the Smithsonian Institution.

His method as a painter was distinctive, its naivety being its strength. And his ability to capture the individuality of his Indians showed rare genius. He is undoubtedly one of our great native artists. Also, he wrote a number of books, some of them invaluable.

Because of Catlin's self-imposed mission, all generations of Americans are indebted to him. For in his writings and especially in his paintings he has preserved for us a firsthand picture of a mode of life once existing within our country's shores but now effaced by the hand of time.

▼ CATLIN exhibited his paintings and lectured on the American Indian widely in Europe and America. This drawing, by the English caricaturist George Cruikshank, reverses the scene. Here a group of red men are being shown the good points of the white man

Reproduction courtesy Harry Shaw Newman, *The Old Print Shop*



RARE SHOW ON THE BANKS OF THE MISSISSIPPI.

Message-Hungry on Mississippi.

LONG LEGS need a LONG NECK

Flocks of flamingos once livened the shallows of southern Florida. Today their strange postures entertain visitors under protected conditions

Photographs by OMAR MARCUS

Reproduced from Kodachrome transparencies



▲ SLIGHTLY KNOCK-KNEED in posterior profile, the gangling flamingo has a throat that has to be an elevator

➤ CURVES AND ANGLES. Its neck and body recall the swan's, but its still-like legs give it a more stately gait

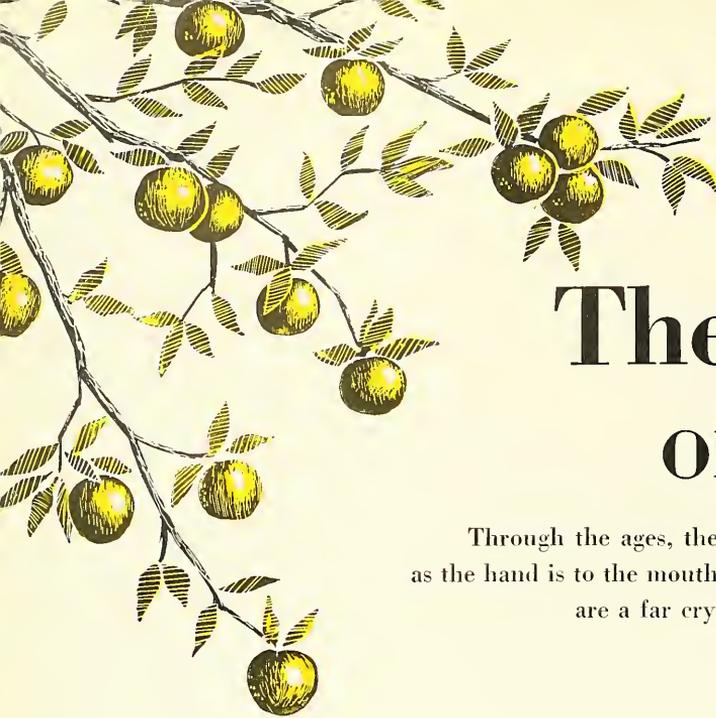




▲ A BIRD whose "heel" is halfway to heaven. Note that the joint in the leg does not bend forward like a knee

➤ AT EASE. Why use two feet when one will do the job





The King OF FRUITS

Through the ages, the apple has been as close to man as the hand is to the mouth, but our modern varieties are a far cry from their primitive ancestor

By ALAN G. MAY

THIS autumn in the United States, enough apples have been harvested to make two and a half billion apple pies. If one were a scientific Sherlock Holmes, he could read between their crusts several thousand years of human history, for the apple is one of the oldest fruits known to man.

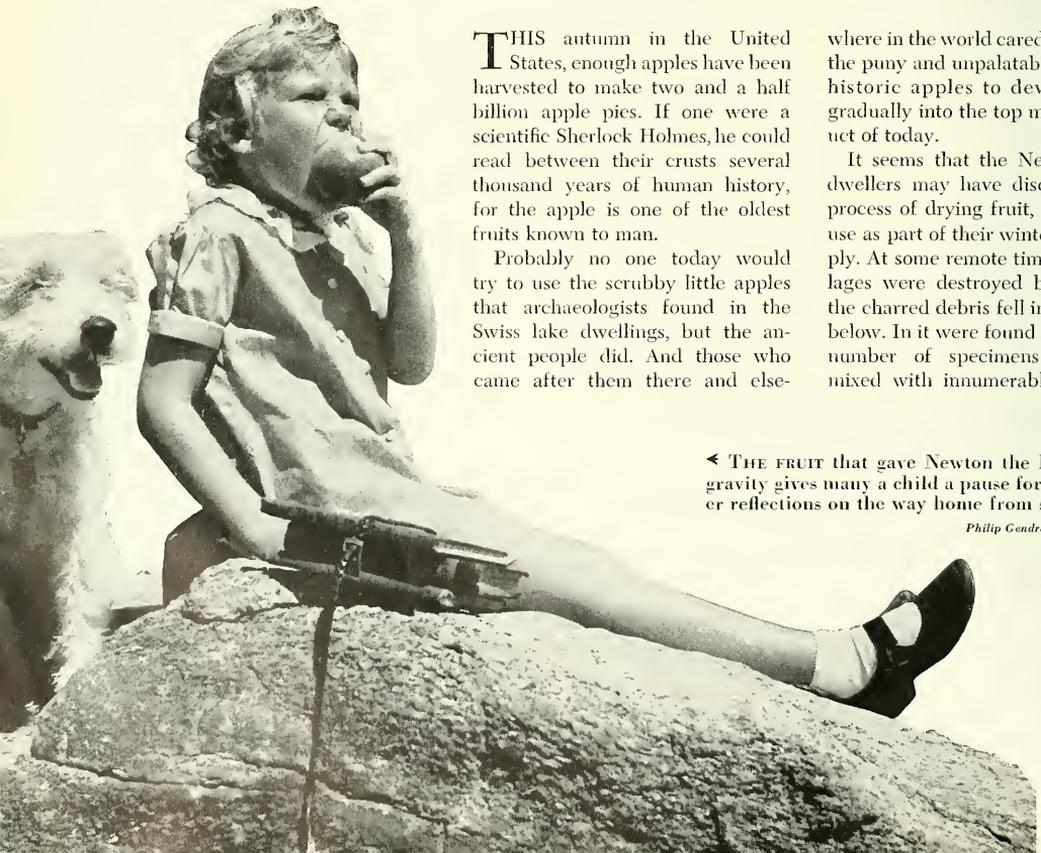
Probably no one today would try to use the scrubby little apples that archaeologists found in the Swiss lake dwellings, but the ancient people did. And those who came after them there and else-

where in the world cared enough for the puny and unpalatable little primitive historic apples to develop the gradually into the top market product of today.

It seems that the Neolithic lake dwellers may have discovered the process of drying fruit, perhaps to use as part of their winter food supply. At some remote time, these villages were destroyed by fire, and the charred debris fell into the mud below. In it were found a surprising number of specimens of apples mixed with innumerable bones

◀ THE FRUIT that gave Newton the law of gravity gives many a child a pause for lighter reflections on the way home from school

Philip Gendreau photo





Ewing Galloway photo



▲ AN APPLE ORCHARD on the reclaimed lava ash of Wenatchee Valley, Washington. This valley ships out 14 million bushels a year, more than half of the top state's total. Irrigated lands sometimes produce over 500 bushels an acre

animals, several different grains, basketry, wooden implements, small fragments of linen, and several other varieties of fruit. The apples were of two varieties, and there were also some apple seeds. Earliest of these villages date from about 2500 B.C., but the apples may be less ancient.

Over five centuries before Christ, Sappho was singing of apples in Greece. Two hundred years later, Theophrastus, apt pupil of Aristotle, wrote concerning them. His people, the Greeks, as well as the Romans, even knew the technique of grafting.

The origin of this craft is unknown, but it is claimed that Hesiod, Greek poet and historian, wrote a thesis on the art of grafting about 800 B.C., though the document has been lost. Five hundred years later Democritus, the "Laughing Philosopher," recommended the grafting of wild figs onto cultivated ones to assist in setting the fruit. Cato the Elder, one of the great Roman writers, gave a detailed description of grafting 100 years later. Virgil, Paladius, Columella, and

other writers of the day were of the opinion that there was no interspecific limit to grafting. They thought that an apple scion grafted on a sycamore, or a cherry on an elm, would produce satisfactory results. Modern research has, of course, shown this to be a fallacy, for even within the same species certain varieties do not make good trees on some stocks.

A book published in Germany in 1562 shows a woodcut of one method of grafting in practice at that time. This picture shows a man fitting a tall branch into the center of a freshly cut tree stump. It is not hard to imagine what a modern orchardist would think of such a procedure.

The "apple" mentioned in the story of Adam and Eve has proved to be a misnomer and a mistake. No apples grew within hundreds of miles of the Holy Land in the Old Testament days, and the apple was quite unknown to the people. Tireless research has enabled the eminent authority Dr. Harold N. Moldenke to conclude, in his

comprehensive book *Plants of the Bible*, that the only fruit to meet all the requirements of the Scriptures is the apricot. The apricot is known to have flourished in that area as long ago as 2950 B.C., whereas the apple was only introduced in comparatively recent years. The mistake may have arisen when the King James Bible appeared in 1611, for here many of the trees, plants, animals, and birds were incorrectly identified. It was in this version of the Bible that the apricot was called an apple, and this and other errors have been continued through the years.

During medieval and Renaissance times, the Biblical "apple" became more firmly established in the public mind through poetic and artistic license. It will be remembered that John Milton identified the forbidden fruit with the apple in his renowned *Paradise Lost*. During the sixteenth and seventeenth centuries, the three famous paintings of *Adam and Eve* by Titian, Tintoretto, and Rubens all depicted the apple as the forbid-



▲ SPRAYING APPLE TREES near White Salmon, Washington

Philip Gendreau photos

den fruit. These magnificent masterpieces apparently captured the public imagination, so that the apple is now generally accepted as the forbidden fruit.

Apples are shown on the frescoes unearthed in the excavations of Pompeii; and today the high esteem in which the apple is held is evident in many popular expressions, such as, "The apple of the eye," "An apple a day keeps the doctor away," and "Apple pie order." The apple has been mentioned in legend and history for 3000 years, and it now grows over a larger area of the world than any other fruit.

Many of the old myths and legends concerning the apple show it to be a magical fruit. In Turkey, apples were believed to possess the power of restoring youth. Barren



➤ AN APPLE PICKER in the Finger Lakes district of New York State, a region that can be proud of its production in various fruits

▼ FIFTY-FOUR CRATES at a time are hauled from the orchard by this tractor trailer



George Pickon from Three Lions



women of Kirghizia imagined that by rolling on the ground beneath a lone apple tree they would become pregnant. Warts were cured in Devonshire by rubbing the two halves of an apple on them. If eaten on Easter morning in Pomerania, the apple was thought to counteract fever. Peasants in Westphalia used apples as a remedy for jaundice. Apples were an object of veneration to the Druids of Britain; and in Thuringia and Silesia, people ate them "from the bottom up" as a medicine for constipation and "from the top down" as a cure for diarrhea.

In comparatively recent times it has been indicated that this fruit is an aid in diarrhea, especially in children. It has also been shown that the apple aids in keeping our digestive tracts in healthy condition; and, as is well known, the fruit possesses valuable mineral and vitamin content.

After the advent of Christianity, the monasteries that were then established became the horticultural centers of the time. From monastic sources were derived all the theory and practice of fruit culture up to the sixteenth century.

One of the earliest accounts of apples in England is in a record which shows that the Abbot of Ely, Cambridgeshire, planted extensive orchards as early as A.D. 674. Then, too, there are several references to orchards in the Domesday Book, compiled during the reign of William I. Named varieties of apples appeared in England as far back as the thirteenth century. It was recorded in 1205 that, by the payment of 200 Pearnains and 14 hogsheads of Pearnain wine (cider?), Robert de Evermere held the Lordship of Readham, England. It is more than probable that our Pearnains today are offshoots of this thirteenth-century stock.

Asiatic in Origin

The apple is apparently native to the mountainous districts of northwest India and to a small area south of the Caucasus between the



Max Hunn from Frederic Lewis

▲ JOHNNY APPLESEED became famous by handing out apple seeds to people in the days before apple raising became an industry

Caspian and Black Seas. Asiatic migrations sweeping across Europe long before the Christian era doubtless took seed with them. The apple and other fruits eventually spread all over Europe, to the Atlantic and to Scandinavia.

As the apple had spread throughout Europe long before the sailing of the "Mayflower," it was only natural that the early voyagers to America took apple seeds with them. Just a small handful would enable a settler to plant an orchard after he reached his destination.

One of the governors of the Massachusetts Bay Colony is recorded as having planted the first European trees in the United States, in the year 1629. About ten years later an orchard was set out in the vicinity of present-day Beacon and Charles Streets in Boston by William Blackstone, who was said to be the first settler of that city and to have owned the first Yellow Sweeting tree.

In 1638, an Englishman by the name of John Josslyn arrived in New England and later wrote he was "filled with wonderment" by the fine orchards he saw and, in particular, by the large amounts of "syder" kept in storage. Mr. Wolcott, a Connecticut magistrate, boasted of having from his own orchard "upward of 500 hogsheads of syder." At this time "an ale-quart of syder, sweetened and spiced," could be bought in Boston for the

equivalent of about eight cents.

For the next 150 years, cider was in great demand as a popular drink. This is shown when Mr. Dudley, the Chief Justice of Massachusetts, wrote in 1726, "Our people have run so much to orchards that in our village [Roxbury] near Boston, consisting of about 40 families, they have made near 3000 barrels of cider." Then, too, records show that in 1799 one settler received \$1200 for having supplied cider to General Sullivan's troops when they were campaigning against the Cayugas and Senecas. The apple was primarily valued as a source of cider at this time, because good eating apples were not yet plentiful.

Peregrine White, first European child born in New England, is said to have planted apples at Marshfield, Massachusetts, by 1646. The following year Governor Stuyvesant planted the first grafted apple tree in New Amsterdam, now New York City. The stump of this tree remained standing at the corner of Third Avenue and Thirteenth Street over 200 years and was finally knocked down by a wagon in 1866. That same year, a law was passed in Massachusetts providing that in the event of the theft of apples, the penalty imposed was to be three times the value of the fruit stolen. During the Revolutionary War, Rhode Island passed a similar law.

The relatively high value placed on apple trees in the mid-1600's is shown by the exchange made by Governor Endicott of Massachusetts when he traded 500 three-year-old trees for 250 acres of land.

The French settlers brought trees and seeds with them in the early part of the seventeenth century when they established themselves along the banks of the St. Lawrence River; and by 1746 the art of top grafting was in practice in Nova Scotia.

William Fritzlugh, a member of one of the first families of Virginia, writing in 1686, described his own orchard as a large one of about 2500 trees, mostly grafted and well protected with a locust fence.

Forty years later, imported trees on good grafted stock from Europe had improved American orchards to such an extent that the aforementioned Mr. Dudley of Massachusetts said, "Our apples are without doubt as good as those of England and much fairer to look at."

Benjamin Franklin, while residing in London, received the first transatlantic shipment of apples from America, in 1755. Great admiration was expressed by Franklin's friends at the quality and appearance of the fruit.

The story of that remarkable man, Jonathan Chapman (Johnny Applesseed), is well known. Driven by an obsession to plant more and more apple trees, Chapman's life became a series of journeys lasting over 40 years. During this time, it has been estimated he covered more than 100,000 square miles of territory. He died in 1843 at the age of sixty-nine of pneumonia caught while making a 20-mile trip through the snow. It may be said that Chapman gave his life for his beloved trees. His last journey was made to protect one of his orchards from cattle, which had entered through a broken fence.

Not many of the trees planted by Johnny Applesseed remain. One was still alive at Stow, Ohio, in 1952. This was one of six huge trees growing on a piece of proper-

ty purchased by Mr. Alton Pardee in 1919. These trees were over 40 feet tall, with trunks about 3½ feet in diameter. Wind, lightning, and old age took their toll until only one remained. This tree was recently almost demolished by a violent windstorm. Only a stump about twelve feet tall was left standing. Since that time, the stump has produced a profusion of suckers and one or two limbs which bear a few small apples.

The rings were counted in one tree after it fell, but it was only possible to estimate its age roughly because the heart was rotten. However, 100 rings were clearly visible. Mrs. Demerias Chamberlain, a lady who lived in Stow for over 50 years, told the young daughter of Mr. Pardee that these were Johnny Applesseed trees and had always been known as such. She also explained how some of "Johnny's" trees could be identified by the peculiar semispherical bulges on the trunks, knobs that were thought to have been connected with one of his methods of grafting. Two of the six trees had such protuberances.

Many monuments have been erected to that extraordinary man Jonathan Chapman, but the best of the monuments were the trees he planted.

It Invades The West

A few years after Columbus sailed to the New World, Spaniards were crossing the Atlantic to South America and Mexico, carrying the apple with them. They introduced apples to our Southwestern states, but the first fruit to reach the Pacific Northwest arrived by way of the Horn. Later apples were brought across the plains by wagon trail.

When Mrs. Narcissa Whitman, wife of Dr. Marcus Whitman, reached Fort Vancouver, Oregon (now Vancouver, Washington), she was delighted to find such a pleasant and attractive country. In her diary of 1836 she wrote, "What a delightful place this is. . . Here we find fruit of every description—ap-

ples, peaches, grapes, pears, plums, and fig trees in abundance. . . Here I must mention the origin of the grapes and the apples. A gentleman 12 years ago, while at a party in London, put seeds of the grapes and apples into his vest pocket; soon afterwards he took a voyage to this country and left them here, and now they are greatly multiplied."* Another account of this same incident relates that a young lady, as a joke, placed the seeds from apples and grapes that had been served at a banquet into the pocket of Captain Simpson of the Hudson's Bay Company, telling him to be sure and plant them in Oregon. Some time after his arrival at Fort Vancouver, Captain Simpson gave them to a Mr. Bruce, gardener for the Hudson's Bay Company, who planted them. Two years after this, the Reverend John Green was told by Captain Simpson, who was then in Hawaii, that the trees appeared to be flourishing.

One tree that grew from the seed brought from London is still living

* In indicating 1824 as the date here, Mrs. Whitman appears to be in error. Cf. Captain Simpson arrived at Fort Vancouver in the latter part of 1826.

Philip Gendreau photo



▲ THE "PEACH STATE" also claims the Big Red Apple, as shown by this emblem in Cornelia, Georgia



George Pickow from Three Lions

▲ PIONEER WAYS are re-enacted on Big Apple Day in Ohio, when apple butter is made in the traditional cauldron over a wood fire



George Pickow from Three Lions

▲ BIG APPLE TIME brings the carnival, and the teen-agers say, "The old folks never had it like this"

and producing noncommercial fruit today. It stands near the Columbia River, protected by a fence and identified by a marker that states: "The oldest apple tree in the Pacific Northwest. The seed was brought from England and planted by the Hudson's Bay Company in the year 1826."

These seedlings were in full bearing and in the prime of life when Henderson Luelling arrived in Oregon by ox train from Iowa. He came with two specially prepared grafts, bearing over 800 selected grafted trees he had grown in Iowa.



George Pickow from Three Lions



▲ THE APPLE QUEEN smiles among branches of Grimes Golden, a variety said to have sprouted from a Johnny Applesced tree about 1805 near Wellsburg, West Virginia

On the long and difficult journey, the trees were carefully tended, being watered whenever opportunity arose. The wagons were drawn by four yoke of oxen, Henderson driving the lead and his young son Alfred following. They found on arrival at Portland, Oregon, then a tiny log-cabin community, that all but an insignificant number of trees had survived the long journey. Luelling settled near Portland and set out his trees in 1847, establishing the first nursery on the Pacific coast. It is satisfying to note that the very first apples from his young

trees brought him one dollar apiece.

It was common practice for the pioneers to dry fruit for their winter use. Some Indian tribes also followed this custom. Along the coast of British Columbia, Indians stored crab apples by a most remarkable method — preserving them in fish oil.

When gold was discovered in California, an unlooked-for opportunity came to the few men in Oregon then growing apples. These fortunate orchardists sold their apples for as high as \$4.50 each, possibly for use as seed. Even in 1855

some of the choicest apples are reported to have brought as high as \$20 to \$30 per bushel, though one Californian wrote in that same year, "Apples find a ready sale at \$8 to \$12 a bushel. . . . Some of our wisest men say that good winter apples will command just as high a price in the San Francisco market for the next 30 years at least."

During the last 100 years, Washington has become the largest apple-producing state. New York is second, Virginia third. The State of Washington ships out an average of 30,000 carloads a year, the majority of these coming from the Wenatchee, Yakima, Okanogan, and Spokane valleys. Last year the value for the state was \$125 million. Wenatchee, center of the state's apple industry, ships out an average of 18,000 cars annually, or about 14 million bushels.

Irrigated valleys of the Pacific Northwest are particularly favorable for apple growing, producing an average of over 500 bushels per acre. More than 1000 bushels to the acre is not at all uncommon.

Although there are more than 2000 recognized varieties of apples, only about a dozen are grown commercially in Washington. Eastern orchards from the New England states down to North Carolina, and orchards in the regions south of the Great Lakes, produce a great many more varieties, although with a lower yield per acre.

Close Cousin of Rose

Belonging to the Rosaceae family, the apple (*Pyrus malus*) is a close relative of the rose, blackberry, and strawberry and also is distantly related to the peach, plum, and cherry. Some botanists, however, give its correct scientific name as *Malus pumila* and separate it and its relatives by classifying it in the family Malaceae. The apple has characteristics in common with hundreds of related species. Similarities can readily be seen between the blossoms of the apple and the wild rose. Rose apples, or the seed pods of the rose, superficially resemble miniature apples.

Four or five species of the wild crab apple are native to the United States. One of these, the Prairie States crab, has been useful in producing hybrids with the common apple. Early settlers and Indians sometimes used the wild crab apple as food, even though it was not appetizing and had but little food value.

Apples will grow in warm climates if there is a winter season in which the trees may rest. Some trees are able to withstand temperatures of 35 to 40 degrees below zero. In Canada some fine apples are grown far to the north of the Great Lakes. Hybrid apples are found even in Fort Vermillion on the Peace River, less than 10 degrees south of the Arctic Circle, as well as in parts of Alaska.

Few seedling apples are the same as the parent stock, their variability being a characteristic most valuable in propagation. Occasionally nature produces excellent fruit: the Delicious and McIntosh apples are good examples. These are often referred to as "Gift of God" varieties. The first Delicious came from a sucker that shot up from a "dead" seedling at Peru, Iowa. The McIntosh was a chance seedling discovered by John McIntosh near Ottawa, Canada. Fortunately these varieties were recognized for their potential value. Such fruit can only be perpetuated by grafting the fruiting wood to root stock.

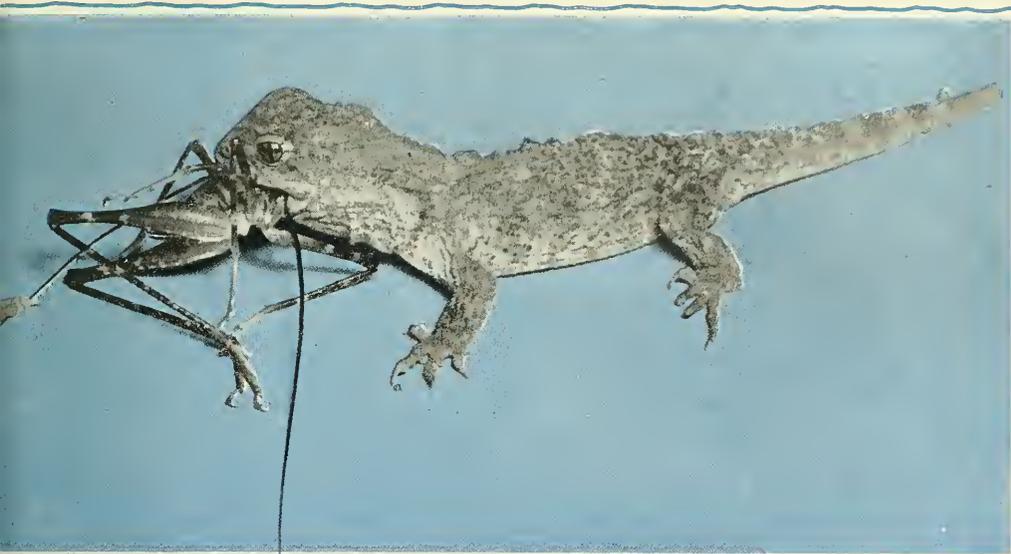
From early days, the culture of apples has had a peculiar fascination for some men, which has resulted in the highly specialized industry of today. Each autumn there are harvested in this country enough apples to supply every man, woman, and child with approximately 80 apples apiece. These are a far cry from the original seedlings, and the difference demonstrates how much nature, aided by the ingenuity of man, can accomplish in less than 350 years. Today, with the aid of modern refrigeration and transportation fresh, juicy apples are available throughout the year in the markets of the world.



First

FOR the first time in history, the tuatara, a unique reptile found only in New Zealand, has been successfully hatched and raised in captivity. This rare animal is related to the dinosaurs and is the sole survivor of a reptilian stock more than 200 million years old. Two of the creatures are now thriving at Victoria University College, Wellington, under the care of Mr. W. H. Dawbin, lecturer in zoology.

About four years ago, Mr. Dawbin found a nest of fourteen tuatara eggs on lonely Stephens Island, Cook Strait—one of the few places where the reptile still survives. He carried the eggs to Wellington surrounded by earth in a jar, but fourteen months passed before they showed any signs of life. He then noticed a dampening of the soil around one of the eggs, and he concluded that it had split. With the sharp-pointed egg-cutter the



Evening Post, Wellington

▲ THE TUATARAS are making a meal of a weta, an insect that is native to New Zealand

Home-Grown Tuataras

In the wild state, New Zealand's strange tuatara has survived from the Age of Dinosaurs, but this is the first time its hatchlings have endured in captivity

grows on its snout, the baby tuatara soon saved its way out and began hammering its head against the damp soil above, which was about four inches thick. The hammering would continue, Mr. Darwin observed, for about five minutes; then the creature would rest for half an hour. Eventually, it freed its legs from the shell and worked its way up through the soil. The head and arms at last broke through the surface, and the hatchling took its first look at the world. The process took about ten hours.

The tuatara has attracted popular interest because it has a "third eye" on the top of its head. This so-called parietal eye is actually more conspicuous in some of the true lizards. But it has probably done more to make the tuatara

known to the public than some of the skeletal details that mark the animal as the only survivor of a very ancient order of reptiles. The eye has a lens and a pigmented retina, but it is covered over and does not function as a normal eye.

For the first week or two, the young reptile ate nothing, and its survival seemed to hang in the balance. Then suddenly, without warning, it made a dart for an insect. Since then, it has fed steadily on wood lice, worms, small snails, and slugs, except during its winter sleep, which lasts about three months.

The second egg hatched out two months later—just sixteen months after it had been laid.

Having the tuataras under observation is adding greatly to scien-

tific knowledge of the reptile's habits. Certain popular fallacies have been dispelled, as for example the belief that tuataras won't drink water. Though they are never known to swim, they are actually very fond of water and drink plenty of it.

Tuataras are reputed to live to a fabulous age, but since none of them have ever been properly tagged, no real facts are at hand. One specimen is said to have died after 77 years in captivity; but it was an adult when captured, so its real age was never known.

Tuataras have been hatched in captivity before, but none has ever survived for more than a few weeks.

² This article was procured through the courtesy of the Director of Publicity of the Government of New Zealand.



▲ A YOUNG STRANGLER FIG, beginning life on the trunk of a colume palm



▲ AT A LATER STAGE, the strangler fig has sent roots down the trunk of its colume palm host to the ground

A Strangler in the Plant World

A slow and silent drama, in which one tree kills another, but only after it has become strong enough to stand in its place

By JOHN W. GREEN

WHILE traveling in the Republic of Honduras in Central America, I observed several cases of what might be called plant parricide. In numerous pastures, I noticed large spreading, broad-leaved trees with palm fronds waving from their topmost branches. Intrigued by such an odd relationship, I investigated and learned how such a situation came about.

I found that it happens when a seed of a certain fig, *Ficus parasitica*, lodges in the base of the fronds of the colume palm, *Attalea cohune*. The seed soon germinates

and begins to send down aerial roots. Before long, these roots reach the ground and increase in size and number. Soon the entire trunk is entwined in a network of roots, and the fronds of the palm are intermingled with branches bearing an alien foliage. In a few years the roots of the fig entirely surround the trunk of the palm and form a trunk of their own. The fronds may soon be entirely hidden in the foliage of the fig. Often the palm dies and in its place stands a different kind of tree—the murderous strangler fig.

▼ INCREASING IN SIZE AND NUMBER, the roots of the strangler fig soon surround the trunk of the palm



▲ EVENTUALLY THE ROOTS of the strangler fig form a trunk which completely encloses the trunk of their host. The fig becomes a huge tree and may kill its benefactor. The tips of the fronds can just be seen at the top of this large strangler fig



▲ THERE'S MORE THAN ONE way to make an umbrella



▲ ROBINSON explains white man's lore to Friday highly individual hut that Robinson built

The Screen

Authentic comments on films

in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

Robinson Crusoe

Reviewed by JUNIUS B. BIRD,
Associate Curator of Archaeology
American Museum of Natural History

ANY BOY currently reading *Robinson Crusoe* and those who have been intrigued with it in the past will enjoy this picture. Some deviations from the original plot were naturally necessary in the filming, but these have been well handled and in no way detract from the story. The producers were wise in not attempting to make the film on Juan Fernández Island, the scene of Selkirk's adventures, which inspired Defoe. Following his lead, they have not identified the location of the delightful spot chosen for most of the picture and have successfully combined the main locale with scenes from the tropical American rain forests. This freedom from a necessity of holding to reality permits the use of thoroughly satisfactory cannibals who defy anthropological classification and the use of varied wildlife from different areas. The choice of actors is good—the mutineers would worry any shipmate who might find them in his crew—and the make-up artists have done an excellent job in creating what might happen to a man during 28 years of life alone in such surroundings. At the end, one feels that if Daniel Defoe, against the background of his quiet home in Halifax, England, could view United Artists' portrayal of his classic, he would be pleased.

Quest for the Lost City

THIS incredibly contrived piece of nonsense—which the producers are attempting to foist off as a 'documentary,' begins with phony antiquities and ends with a phony rain storm," writes Dr. Harry Tschopik, of the American Museum's Anthropology Department. "In between, there are more factual errors and misrepresentations than it would seem possible to assemble in one feature-length picture.

"The theme deals with the adventures of an enterprising couple of professional explorers, the Lambs, during their quest to discover a lost Maya city in the jungles of Guatemala. For the record, they actually did find a ruin of sorts; but as to the monkey business involved in so doing, I am highly skeptical.

"Although the geography in this epic couldn't be more hazy, it seems that the Lambs set out in a broken-down Model T, which carries them through Mexico to an

Brief comments on films previously reviewed

Documentary and Grade A

Africa Adventure

Primarily concerned with the hunting and killing of animals

Will appeal primarily to sportsmen

Out of This World

The best color film on Tibet that has been made available to the public

An instructive, entertaining film, with some window dressing

The Royal Tour of Elizabeth and Philip

Beautiful and elaborate dance scenes, memorable scenery

Native customs that have become part of the pageantry of a world society on a wider stage; dignified

The Vanishing Prairie

A Disney film dealing with the vanishing wildlife of the American Prairie

Exciting, instructive, and highly entertaining

Down the Alphabet

Duel in the Jungle

A composite made up of a rather improbable plot laid in a synthetic Africa

Reasonable entertainment

The Egyptian

Based on the book by the same name

An interminable and pretentious picture



THE MAKE-UP ARTISTS made Jim age convincingly

unspecified place where they conveniently acquired an equally broken-down plane. In this they fly over the mountains and jungles of Guatemala looking for new lost cities. The narration tells us, condescendingly, that scientists have also discovered 'a few of them.' They have; about a thousand.

"The remainder of the film is concerned with their attempt to reach the ruins, once they have been sighted, from the ground. Here the cutter or somebody else went haywire, because the scenery switches back and forth between the highlands and the lowland rain forest with a rapidity that is dizzying. In between, are sandwiched sequences shot on a banana plantation, a studio stage, and possibly a zoo. We are asked to believe in a formidable mountain barrier that cuts off the Maya ruins from the outside world, which may be passed only by traveling for six days and nights through a mysterious underground cavern.

"Most of the action—if you can call it that—deals with the Lambs' highly eccentric living arrangements in the jungle. For some perverse reason they seem determined to do everything the hard way. They make fire by rubbing sticks together and even prepare their own soap from wild turkey fat. Yet they tote along a sizable tent and ample kitchen utensils.

"Finally they reach the ruin, but we see precious little of this because of the fake rain storm, which causes a tremendous flood and marks the beginning of the wet season. In the end, the Lambs sail happily away in a dugout canoe, which they have hastily scooped from a balsa log.

"If we must have fantasy, let's have fantasy. But let's not have fantasy served up as a documentary."

Your editor cannot help commenting that she feels the producers have struck a new low when they not only misinform the public, but even fail to entertain them.

BOOKS

continued from page 388

Everest in 1952. The Swiss pioneered a way through barriers on the high southern approach long considered impassable. The British followed their route a year later. We have the testimony of Sir John Hunt, who provides this volume with its preface, of the part that the Swiss explorations played. He wrote the Swiss in response to their message of congratulations: "A vous autres une bonne moitié de la gloire." In this work we come to understand his sentiments.

Not only is this a document of courage, audacity, and discouragement at the brink of success, it is a fine piece of writing. Indeed it can serve as a handbook for those who would report on expeditions, as well as a handbook of mountaineering.

The Swiss expeditions, launched upon Everest for the first time in 1952, were staffed by famous Swiss mountaineers and backed by the Swiss Foundation for Alpine Research. Included were a geologist and a botanist, who also made observations of the limited animal life. Excellent photographs and detailed maps enable the armchair explorer to follow every move and wrestle with each problem. One wonders at the prevalence of malaria at crucial altitudes and considers the possibility that the total effort may have been weakened just beyond the critical point. In reading the book, we feel the lassitude and apathy that rob men at high altitudes and suspect the unavoidable rivalry that must exist between close friends at the threshold of such a prize. Again and again we are amazed at the Sherpas, of whom Tensing is such a fine example. When at the end they can only carry 22 pounds, we sense the effort involved, knowing that a Sherpa

will carry 85 pounds at "normal" altitudes, that he will double this for special wages, and that women have been seen carrying 140 pounds in bare feet.

This book sets forth the beauty of the strange Nepalese valleys, the symbolism and art of the peoples who live in them in their colorful dress and quaintly carved, ornamented houses.

Provocative, scientific observations of the "Abominable Snow Man" are included, and, before anyone guffaws, let me state that "his" footmarks were found above 15,000 feet on a rampart of Everest never before scaled by man. The scientists of the first Swiss expedition measure them as follows: 11½ inches long, 4¾ inches wide, and 20 inches apart, forming a single line. Whatever this mammal might be, it must but rarely visit the higher parts of Everest where food is virtually lacking, although the expedition botanist did collect species of grass at 21,000 feet.

In conclusion, this most interesting report from the pens of the expedition members, telling the story of the two gallant Swiss Everest expeditions, is a document that deserves our admiration.

E. THOMAS GILLIARD

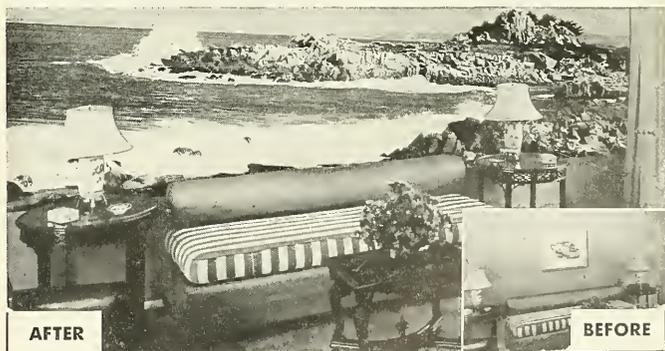
NATURE PARADE

----- by Frank W. Lane

Sheridan House, \$5.00

331 pp., 70 illus.

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Ways of Mammals



• In Fact and Fancy

Clifford B. Moore, Director, Forest Park Museum, Springfield, Massachusetts

The facts behind the myths and superstitions concerning the world of mammals. This delightful book describes the fascinating, often misunderstood habits of animals—from the domestic to jungle beasts. Written in lively, interesting style, it includes several sections by authorities on particular aspects of animal behavior. 273 pp. \$3.50



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• A Working Guide

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THE RONALD PRESS COMPANY
15 East 26th St., New York 10

not some wild animals actually plan their actions to meet circumstances and conditions. He reiterates such traditional stories as that of the fox that entered the water with a stick in its mouth and let it float away when the fleas had swarmed on it to escape.

The author writes with ease and simplicity and has marshaled a wealth of material so effectively that he has included much of the original history and drama behind his statistics. The reader will be fascinated by the strange proceedings followed by some animals in procuring food, by the fastidiousness that some have about their personal appearance, and the great length to which they go in fixing their toilet, as well as by the oddities of sleeping habits (including birds that sleep airborne in the clouds). For the last fact I will not vouch, but the author has documented facts lined up in a convincing manner. There is an entertaining chapter about the leaders and dictators in the animal kingdom, about war and conflict in nature, about doctoring the sick, and the use by animals of herbs with healing qualities in the treatment of wounds.

The section on speed and locomotion is a useful collection of statistics. Do you know how much horsepower is required to drive a huge whale through the water at cruising speed, which animal has the hardest punch, and what creature holds nature's record for suction power? All these facts and many other remarkable records are included in the amazing revelations of this book. The last section is on mystery beasts, and it gives the inside story about the "Abominable Snow Man" of Mt. Everest that has recently cropped up with renewed interest, the mandi bear of Africa, and other accounts of strange creatures that have never been satisfactorily confirmed or discredited. The book is illustrated with a most unusual series of action photographs and has a complete index.

GEORGE C. GOODWIN

CORO-CORO

THE WORLD OF THE SCARLET IBIS

by Paul A. Zahl

Bobbs-Merrill Co., \$4.50

264 pp., 42 ills., 1 map, 1 color plate

DR. Zahl's latest contribution is a tale of exploration, adventure, and suspense in quest of a colorful, elusive bird in dangerously flooded, uncharted mazes of the middle Orinoco River in South America. The storyteller dodges the usual pitfalls of exaggeration as he welds his yarn to the search for the breeding grounds of the Scarlet Ibis. But that goal is merely a clever crutch to peer behind a hundred jungle façades at the sometimes gorgeous, bizarre, or even loathsome creatures that flourish in the humid,

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seething land of the crocodile and *caribe*.

The narrative sparkles with provocative facts, and the author's way with colorful anecdote is refreshing. Born of an idea that flashed across his mind in the New York Zoological Park, the guest takes the reader into a snowballing adventure. He stands by as support is obtained from the National Geographic Society, helps to outfit the one-man expedition, and participates in its camps and cruises. In time, he gets the idea that he could probably have carried off the mission himself.

Dr. Zahl's love of the "bush" is particularly interesting in the light of his life as a research scientist fresh from the comforts of New York City. His sincerity is crystal clear when he describes and interprets the facets of the jungle and when he audaciously wrestles at the core of life. At such times, his theme glows with much more than the brilliant plumage of the ibis. Thus the reader is carried along in a current of exploration fraught with unpredictability and danger, and is constantly confronted with stimulating discoveries and suggestions. Titbits are to be found in the riddle of the vast avian cities called rookeries and the sex or sex-impelled activities of the Scarlet Ibis, as compared with observations the author might have made in Times Square; the solution to the complex relationship of the White and Scarlet Ibis; the asides pertaining to avian migration with its in-born memory, extrasensory perception, and its survival motive, which "as love laughs at locksmiths, laughs at the problems of bird navigation." And, too, the reactions of the scientist, who bows only to knowledge intellectually derived, when he finds himself hopelessly lost and roasting in a rat-maze of grass-lined waterways. In sum, one cannot read this book without experiencing pleasure, nor without deriving a keener understanding of the magnificently adaptive, resourceful mammal who has come to recognize no environmental barrier, be it land, sea, air, space, or the inhospitable swamp home of the Scarlet Ibis.

E. T. GILLIARD

A WOMAN IN THE POLAR NIGHT

by Christiane Ritter

translated from the German by Jane Degras

E. P. Dutton and Co., \$3.00
223 pp., 24 line drawings & map

MANY books have been written by women who have followed their husbands to distant places and have kept house under unusual and difficult circumstances. But Christiane Ritter probably has the distinction of going farther north than any other white woman, having spent a year on the north coast of Spitzbergen, almost 10° north of Point Barrow, Alaska,

and about 4° north of Cape York, Greenland, where Mrs. Peary once wintered.

The author's husband, an Austrian, had gone to Spitzbergen on a scientific expedition—the object of which is not mentioned—and had stayed on for three years, fishing and trapping. His enthusiastic letters finally persuaded his wife to join him. Her first sight of the hut where she was to live was not encouraging; "a small, bleak, square box, completely covered in black tarpaulin." The stove smoked, and the household equipment was extremely meager. The land was hidden by mist and rain for the first weeks; what could be seen was "gray, bare and stony . . . not a tree or shrub." Finally, toward the end of August, the weather cleared, and Mrs. Ritter writes: "We are living on an indescribably beautiful piece of land. The mountain range across the water is steep and rugged. A deep blue-green, the mountains rear up into a turquoise-colored sky. From the mountaintops broad glaciers glittering in the sun flow down into the fiord. The mountains take on every shade from red to lilac; . . . everything is lit by a supernatural brightness." From then on, the author began to feel more and more at home and to understand her husband's love of the North. She made trips by boat, and later on skis, with him and his partner while they fished and trapped. Several times she stayed alone, once for more than two weeks, in the middle of winter. They saw no one until spring, when a hunter brought their mail on a 150-mile journey by dog team. Their only companions were the birds and animals, especially "Mikkil," an arctic fox, who became so tame that he would follow them like a dog. There was a ptarmigan who came to the door several times a day to be fed and a seal who would lie on the ice near the hut for hours, watching them.

Probably not many readers will wish they could duplicate Mrs. Ritter's experience, but they will admire her and will come away with a better understanding of the Arctic.

M. B.

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by William Bridges

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in a zoo. The author had the background of a newspaper reporter and had been sent by the *Sun* to cover a zoo expedition to Trinidad and British Guiana before he came to the Bronx Zoo as Curator of Publications in 1935. As a member of most of the expeditionary activity of which he writes, Bridges gives accurate firsthand impressions of the many interesting things that happen.

There is considerable variety in the coverage of this book. The collecting takes place in Mexico, Trinidad, South America, Africa, and, by way of contrast, in staid Rhode Island. All living animals are potential grist for the zoological mill, and interesting features are on the program for each

party sent into the field. This is true of the primary object of the search as well as for the many side issues that usually develop when experienced field collectors know how to watch for them.

The reader of this narrative account, written by the way with a minimum of taxonomic digression, will be interested and entertained in learning something of how these rarities are secured for the zoo and perhaps equally so in the many human interest incidents that involve field personnel.

Many well-chosen photographs are included. They add considerably to the drama in the text.

HAROLD E. ANTHONY

LETTERS continued from page 386

some physical disability, failed to shed its first set of antlers and in due course grew a second pair from the sides of the pedestals. Despite the fact that the normal place for growth was still occupied by the old antlers, the growing force behind the nucleus for the new set impelled them to burst out at the sides. The strange thing here is that the new antlers grew symmetrically and perfectly formed.

The inner antlers are the original pair, as shown by their bleached condition, and their small size indicates that they are probably second-year growth. The outer antlers are of a three- or four-year-old animal and may come from a base that sheds them in the normal way each year. Insofar as I know, this is the only incident of its kind recorded.

Civilization in New Guinea

AN ARTICLE entitled "New Guinea's 'Lost' Tribes," by Albert E. Norman, published in the August 19 issue of *The Christian Science Monitor* described Stone Age natives recently discovered in central New Guinea. It mentioned that the announcement of their discovery had roused some Australian citizens to protest to their government against "encroachment" on the territories of these modern remnants of prehistoric tribes. When NATURAL HISTORY Magazine asked for comment on this question from the American Museum's New Guinea expert, E. Thomas Gilliard, who had recently returned from the interior, he gave us the following statement:

* Time to think of *

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aries representing the gamut of sects and mythologies, and the lands in all directions have been looked over from the air by mission pilots. One group has four planes of its own. Thus the entire geographical picture has been re-appraised. On the ground, beginning at a point only accessible by air after a dangerous flight over the top of the Bismarcks, one suddenly sees road signs reading: Chimbu 63

miles, Mt. Hagen, 130 miles, etc. Nearby was an entire town, complete with stores, a 15-plane hangar, coffee mills, passion-flower pulping mills, a garage, 50 assorted cars and trucks, etc., all of which had come aboard DC 3's shuttling back and forth from Madang. And all the while, men are striving to cut an overland highway that will be a miniature Burma Road.

"All this poses no simple problem for the native, but it is my opinion, that, much as I admire the native way and hate to see men destroying the ancient culture, there is nothing we can do that will have any lasting effect. And one should not paint a dismal picture, because the Administration is an enlightened, sympathetic one. Veterans like Ivan and Claude Champion are in charge of important posts. Allan Roberts, who reported the new valley of 'Lost Tribes' from the air and who is directing the 'peaceful penetration,' has had long experience in all branches of District Services and is fully sympathetic to the natives. His young patrol officers must take special college courses in anthropology, and they are a picked group. Much effort is expended in trying to help the native to survive the impact of change, and I have seen many instances showing that the native is treated fairly and with sincerity. Care for the sick and educational facilities are being provided in areas where exposure to European ways has built a willingness to cooperate. In interior areas, the native is only urged to give up his ancient homicidal tendencies and learn to accept medical and hygienic advice. There is, of course, the matter of government work, which amounts to one day per man per week, applied in building bridges, etc.

"I am not saying that I prefer any of this over the proposition of leaving the native to live in his capsule of primitive society. My point is only that, since change is inevitable, I think the Australians in New Guinea are doing a valiant job. In a report of the Administration of the Territory of New Guinea to the General Assembly of the U.N. covering the period from July 1951 to June 1952, so-called restricted areas of the Territory embraced 15,000 square miles, and they had not grown less since the preceding year. In addition to this large area, there is another of almost equal size adjoining it in Papua, which is just as primitive. Together they form one of the largest remaining unexplored areas on earth. Australia, to undertake part of the cost of this great job, has let out certain permits to reputable institutions representing private enterprise, and it is these we see at work. The Administration operates at a very large annual deficit from funds supplied by the Australian people, and no one else. As far as things have gone, I feel that we should be thankful that those in charge have shown a conscientious attitude toward the native."

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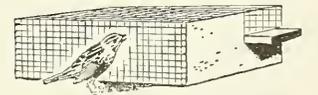
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wife contained no injunction against a mate being a member of a lower, or nonaristocratic class. Children often showed strong Negroid characteristics, but this did not prevent the child, if a boy, from inheriting the social standing of his aristocratic father.

It seemed to us that the hardened customs of the Touat regarding the position of woman robbed their society of 50 per cent of its potential. The women must stay close to their homes; they must go veiled; they must look after the children; and they must mind their husbands. Women in the lower classes work long hours in the gardens, but their position is still a subordinate one. The complicated Moslem laws of marriage do nothing to help the security of women, and too often prostitution is the only means of livelihood once a woman has been cast off.

Veneral disease, as well as trachoma, malaria, and dietary illnesses, are frequently encountered. Dr. Dieterlen told us that he and his commanding officer, Major René Joseph, were forced to combat home-grown remedies and superstitions as well as the diseases themselves. Although prestige is still won by those who make a pilgrimage to Mecca and return to the Touat, the oasis people have adopted into their religion a number of practices that apparently have been imported with the Negro slaves. Fertility charms are displayed in gardens, and we saw any number of animal bones, most often skulls, perched on garden walls. Locks of hair are pasted on homes, and bits of bones and other objects are buried inside the walls themselves. A primitive kind of medicine also is practiced; the application of a red-hot iron to whatever part of the patient's body hurts most. This drastic treatment, Dieterlen said, helps in one way, anyhow. The patient's past medical history can be guessed by the location and amount of scar tissue left on his body by the irons.

Work in the educational field as well as the medical is helping to break down the rigidity of the Touat society. Until recently, education was entirely confined to the Koranic schools in the villages. We watched these schools in operation. Each child, no matter how small, was given a large and heavy tablet to hold, on which were written verses of the Koran. The average pupil will never learn to read his tablet, but following the lead of the teacher, he will eventually learn to recite the verses by heart. We got the feeling that parents sent their children to the schools as much to keep them busy as for any other reason. The French administrators maintain a school in Adrar, and they do whatever they can to broaden the horizon of their pupils. For the exceptional student, there are schools of higher education, leading to the Sorbonne itself in Paris.

It seems inevitable that something must "break" in the present rigid structure of the Touat because of pressure from the outside. Newly discovered resources in the Sahara are inaugurating social improvements along with technical developments. The Touat area used to be known as the "Route of Palms" because of the old trade caravans. This source of prosperity has long since ceased to exist, but a new economic basis is being sought.

Without question the people of the Touat are tenacious and strong, toughened by centuries of precarious life in the Sahara. The French administrators, as they see it, have the twin tasks of not only demonstrating the advantages offered by Western technology but also of helping the people adapt their social organization to a broader world. When our truck broke through the canal outside the Touat village, the break was symbolic of a larger, impending crisis. If the oasis inhabitants can learn to adapt themselves to new conditions, then the Route of Palms need not be written off as a dead end.

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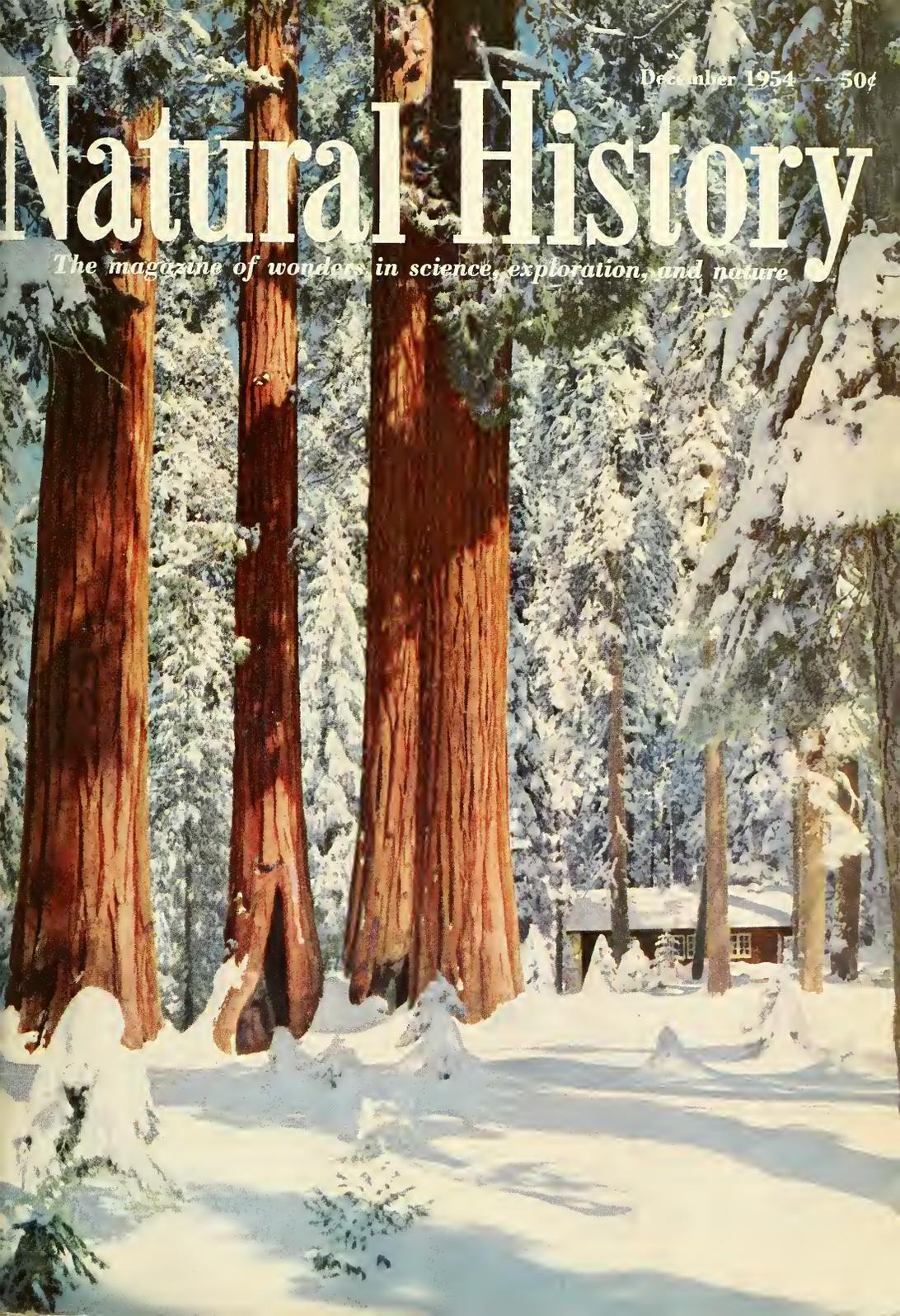
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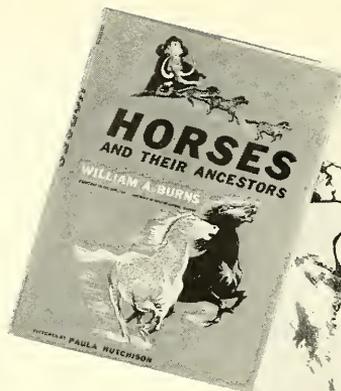
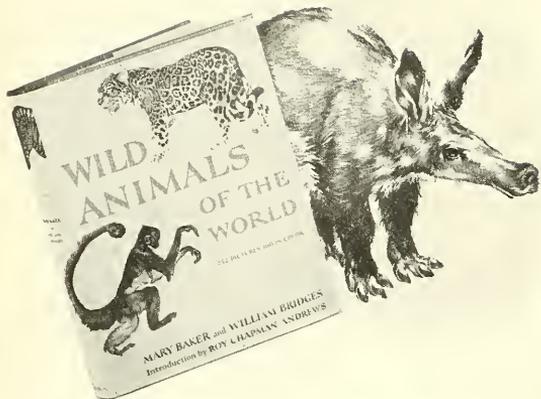
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Natural History

The magazine of wonders in science, exploration, and nature.





Wild Animals of the World

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A delightful, word-and-picture story of the development of horses through the ages. The author, who is Assistant to the Director, American Museum of Natural History, tells the fascinating story of how differences in food, climate, and breeding have transformed the dawn horse, no larger than a fox, into the strong, much-loved animal of the present day. Enjoyable reading for young and old alike. 64 pages, 144 illustrations (many in color) \$2.

Indians of the Plains

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This is the first volume in a new series of anthropological handbooks published for the American Museum of Natural History. Written by a world authority, it is a vivid recreation of the life of the Plains Indians who figure so largely in our history, and who lived in a manner quite different from other Indians. Here are the Dakota, Crow, Blackfoot, Cheyenne, Plains Cree, the Kiowa, Mandan, and the Ute tribes, from the time of their discovery today. 100 drawings, photos, maps, 207 pages, \$4.75

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THE AMERICAN MUSEUM OF NATURAL HISTORY, NEW YORK 24, N. Y.

▼ AN AMERICAN EGRET, taking flight upon discovering the presence of the photographer. Note the graceful sweep of the wings as they move forward. The trailing plumes, called aigrettes, are seen in their extreme length. At right, one of the egrets is making a sudden turn over the rookery near Okeechobee, Florida

Hugo H. Schroder photos



LETTERS

A Fishing Snake

Sms:

In the rugged Chiricahua Mountains in the southeastern corner of Arizona, there are numerous beautiful canyons in which small creeks flow. One fall afternoon while sitting quietly on the banks of such a creek, I observed a most unusual sight. I first noticed that numerous small minnows an inch to an inch and a half long were swimming up stream and jumping over small falls four to six inches high, much as salmon do in the Northwest of the United States.

This was new to me, but as I watched I saw a sixteen-inch water snake make its way onto a ledge of rock that partially overhung one of the falls.

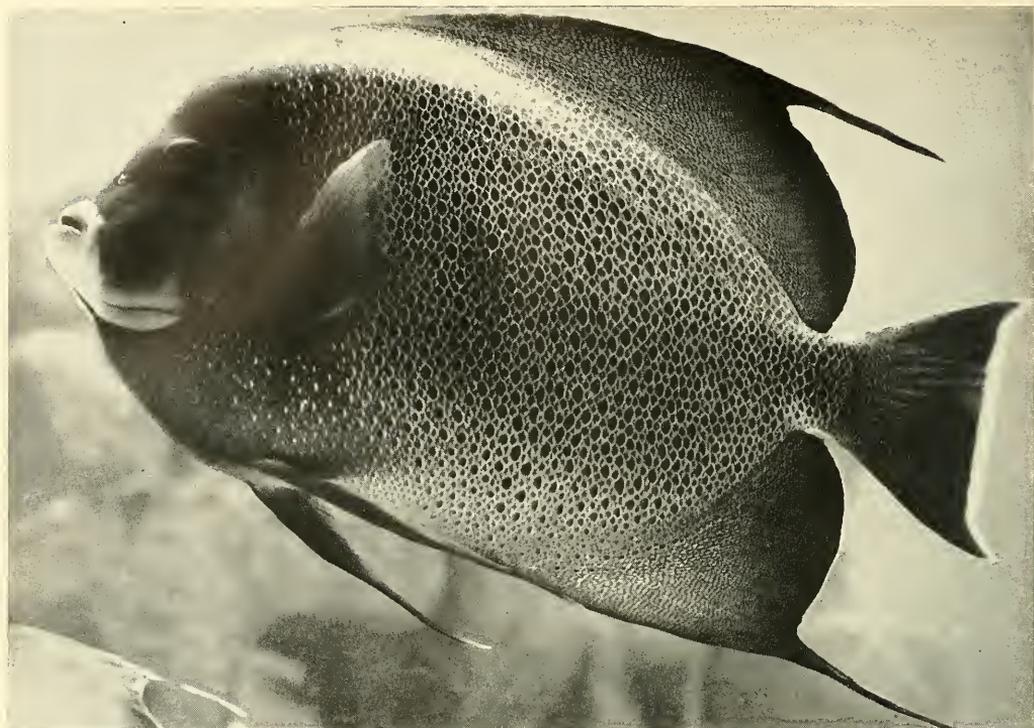
The snake crawled until about four inches of its body projected over the water of the falls. From this position it darted its head out and caught minnows one by one as they tried to jump over the falls. It seldom missed and was thus able to secure a substantial meal without much exertion.

CARL TRISCHKA

Warren, Ariz.

The following comments are offered by the well-known snake expert, Charles M. Bogert, of the American Museum's Scientific Staff:

Mr. Trischka's snake may have run up a higher than average score, but it should not be considered to have patented a new method among its kind. More often garter snakes seek out the quiet pools, particularly isolated pockets where fish have been stranded after a flood. Several times I have watched garter snakes under such conditions, but my snakes missed oftener. The snake Mr. Trischka saw may have availed itself of the relatively slow movements of the minnows bucking the current in the riffle. They usually have to strike



Paul A. Darling photo

▲ ANGELFISH: a spectacularly colorful and beautiful resident of Marineland Oceanarium. Photographed through one of the two-hundred glass ports that line the sides of each of the two tanks, at various depths

repeatedly to obtain one fish, or even a tadpole, which is ordinarily not so agile as a minnow.

Stumped Stump

SIRS:

I was much interested in Nell Murbarger's article, "Our Largest Petrified Tree." The article says that one of the world's largest known petrified trees—possibly the largest of all—is Nevada's so-called Monarch of the Black Rock, which measures 46 feet in circumference. Perhaps I should mention that one of the attractions at Pike Petrified Forest at Floressant, Colorado, 40 miles from Colorado Springs, is a fossil stump that has a circumference of 61 feet. Possibly the author of your article was talking only about the Nevada champion.

DORIS WALKER

New London, Ia.

Nevada seems to be stumped by Colorado.
—ED.

"Giveaway, Chipaway"

SIRS:

... You are to be congratulated upon "Sulphur—For Our Way of Life," dealing clearly with the great changes in Louisi-

ana since I shifted residence from New Orleans to California in 1922.

Even more I appreciate "Shall We Auction Olympic Park?" Particularly in these "giveaway, chipaway" days, it is a great contribution...

O. C. GOULD

Monrovia, Calif.

SIRS:

I have just read Weldon F. Heald's excellent article "Shall We Auction Olympic Park?" Though I seldom comment on these things, in this instance I could hardly restrain myself. From where I stand, only one thing can be added: Some people are privileged to obtain their notions of beauty from an annual jaunt to Europe... But most Americans cannot afford such trips and must be content with a rare pilgrimage to a National Park or other soul-stirring spot... These latter, it seems to me, should be considered the real owners of the Park. Otherwise we shall wake up some morning and discover that the Haves have taken even this from the Have Nots. Could anyone be so jaded as to look upon that magnificent Rain Forest as 17½ billion board feet of lumber? Breathes there a man with soul so dead...?

Congratulations on such an excellent publication. It is one of the most worthy I have had the privilege to read. Beautiful format. Interesting and informative contents.

JOSEPH A. HOWELL

London, Ohio

Cable Cars May Mar Ruinier

SIRS:

I want to congratulate you on your fine article urging protection of Olympic National Park, which is one of the loveliest natural wonderlands in the country.

Now the beauty of another Park is threatened, and I thought perhaps your readers might want to be forewarned. When I visited Mt. Rainier National Park with my late husband, it seemed to both of us that it was the most utterly unspoiled spot anywhere and beautiful beyond words. We arose early to watch the sunrise, and as daylight advanced and the air became warmer, the atmosphere was so sparkling that I told my husband it made me feel about sixteen years old. It grieves me to learn that a cable lift of some sort is contemplated there, which cannot help but impair the beauty of the

continued on page 476

NATURAL HISTORY

The Magazine of the American Museum of Natural History

Bringing you the best in scientific thought and opinion in exploration, research, and the world of nature

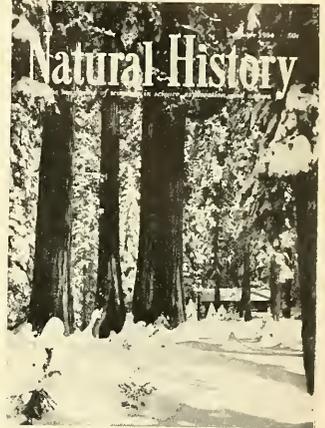
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December, 1954
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THE COVER THIS MONTH

This winter scene in Sequoia National Park in California shows one of the many Park areas to which more and more winter visitors are being drawn. The untrammeled stillness of Sequoia's vast wilderness is best sensed in a snow-blanketed spot like this, where small robed figures seem to kneel beneath the great brown giants. Sequoia is open all year, with a definite season from about December 10 to March 1, depending upon snow conditions. Many come simply to see the big trees in winter. The road is open as far as Lodgepole, with lodging at various winter camps along the way. Skating, snowshoeing, and tobogganing are also enjoyed. The Park Service encourages cross-country skiing by experienced people rather than artificial sport by means of chair-lifts, etc. The coldest recorded temperature is 3 degrees above, the average 15 to 45 degrees; but the snow averages 4 to 5 feet, with 10 feet usual in the forested areas and a record of 25 feet. A folder explaining accommodations can be requested of the Superintendent, Sequoia National Park, California.

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Bats

CHARLES L. RIPPER

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Paws, Hoofs, and Flippers

OLIVE L. EARLE

The story of the mammals from a new angle, told and illustrated by a well-known, authoritative artist-naturalist. "Recommended for all natural history collections."—*Library Journal*. Ages 12 up and adults. \$3.50

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THE ANIMAL KINGDOM

Frederick Drimmer, Editor-in-Chief. Text by George G. Goodwin (*Mammals*), Charles M. Bogert (*Amphibians and Reptiles*), Dean Amadon and E. Thomas Gilliard (*Birds*), Christopher W. Coates and James W. Atz (*Fishes*), and John C. Pallister (*Invertebrates*).

Greystone Press, \$15.00

3 vols., 2062 pp., 20 full-color illus.,
550 drawings

DESIGNED to present an enormous quantity of factual information over the broad field of the animal world, these volumes make a useful compendium. Readily at hand on the library shelf, they may serve to answer a multitude of questions in the family circle and also may offer attractive reading to those with natural history interests. The style of writing is direct, the many line drawings interesting, the photographs and color plates attractive, and the printing and format excellent. That the information is authentic and down-to-date is guaranteed by the competent staff of authors, all recognized for their scientific ability and all field naturalists as well as experienced laboratory workers.

The main emphasis is on the mammals, which fill the first volume and nearly one-third of the second, including a concise two-page summary that places man against the background of his physical contemporaries. Birds of the world and amphibians and reptiles complete the second volume, while the third contains the fishes and the invertebrates. The pages devoted to the latter cover the lower orders of animals in reasonable summary, and then devote the bulk of the space to the multitudes that constitute the insect world. A key to the information presented is found in the detailed index under both English names and scientific names.

Standard accounts of the natural history of animals have had a place in human interest since the dawn of learning. Each succeeding one, dependent to some extent in its basic framework on its predecessors, has embodied the more ample information found in the current knowledge of its time. The present version is a modern expression of this need, a work that this reviewer is pleased to add to his row of books concerned with general natural history.

ALEXANDER WETMORE

THE EAGLE, THE JAGUAR, AND THE SERPENT

Indian Art of the Americas
North America: Alaska, Canada,
the United States

— — — — — by Miguel Covarrubias

Alfred A. Knopf, \$15.00

314 pp., 12 color plates, 112 drawings,
100 photos

MIGUEL COVARRUBIAS is an extraordinarily versatile individual. Most people probably think of him as an artist of international reputation. He is also a caricaturist, a writer, and a professional anthropologist.

Covarrubias the anthropologist produced two fine popular studies of native life in Bali and on the Isthmus of Tehuantepec. Now Covarrubias the artist has written a readable and beautiful book about the Indian art of North America. Curiously enough, this is the first major study of aboriginal North American art to be written by a man who is himself an artist.

The choice of illustrations clearly indicates that they were selected by someone with a sophisticated sense of form, design, and color. True, many often-illustrated objects are depicted once again, but this is understandable. They are important pieces, and their omission in so comprehensive a study would be unthinkable. On the other hand, the author has seen beauty in objects that most anthropologists would consider commonplace. As might be expected, since the drawings and paintings were executed by the author himself, the illustrations are exceptional. The photographs are likewise first rate.

After a discussion of American Indian origins—in which the role played by trans-Pacific contact is heavily stressed—Covarrubias sketches very briefly time horizons in American archaeology. This is followed by a concise review of the techniques available to our native Indian artists. The balance of the book is devoted to an areal treatment of Indian art from the Arctic to the Mexican border.

There are some inaccuracies and oversimplifications. Some specialists will feel that "their Indians" have been slighted or distorted, but this is inevitable when one considers the book's great scope and the vastness of the field. Nevertheless, many readers will be stimulated by the provocative text and the handsome illustrations. Both author and publisher are to be congratulated.

HARRY TSCHOPIK, JR.

THE FLOWERING CACTUS
 - - - - Edited by Raymond Carlson
 Sketches by George M. Avey
 Photos and Technical Data
 by R. C. and Claire Meyer Proctor
 McGraw-Hill, \$7.50
 96 pp., 81 full color, 38 bl. & wh. illus.

"THE dry land shall be glad and the desert shall rejoice and blossom as the rose." Such phenomena, described in the Bible, are shared by the so-called American Desert of our Southwest and adjacent parts of Mexico. And the protagonists among the flowering plants of the arid lands belong to the Cactaceae, a family of some 1600 species. These are probably all native to the New World, but some of them became established around the Mediterranean so soon after the discovery of America that nineteenth-century painters freely depicted them when reconstructing landscapes of the Athens of Pericles.

This is the first book showing flowering cacti in the glory of color photography, and its 81 reproductions, in more than a score of which single pictures fill a quarto page, tempt one to say that it has attained a new pinnacle of spectacular success. White, yellow, orange, cerise, burgundy, purple, and shades of burnished bronze gleam from the paper as from the living tissue of blossoms.

The author and the illustrators "belong" to the cactus country, and the task they have fulfilled is no less practical than beautiful. The types of cactus, from hedgehog and prickly pear to towering saguaro and organ-pipe, are described in nine chapters. The night-bloomers are distinguished from the more familiar kinds that open in the morning, but it is pointed out that nearly all cactus bloom is intolerant of strong sunshine and short-lived when exposed to it. The season of blossoming is recorded for many species, and the extraordinary specializations of morphology and life processes in these plants, together with hints as to their origin and evolution, are included in Mr. Carlson's text.

Chapters on cultivating and photographing cacti, a guide-list of many flowering species of all the New World, a short bibliography of scientific monographs on the family, and a diagrammatic map of cactus distribution in the North American Southwest add to the usefulness of this gorgeous, glowing book.

R. C. M.

**TALES OF THE
 AFRICAN FRONTIER**

- - - - - by J. A. Hunter and
 Daniel P. Mannix

Harper Bros., \$4.00
 308 pp., 31 photos, 1 map

FEW people realize what an important part mammals have to play in the de-

Published for the
 AMERICAN MUSEUM OF NATURAL HISTORY

Indians of the Plains



ROBERT H. LOWIE

Professor of Anthropology
 University of California

Foreword by HARRY L. SHAPIRO,
 Chairman, Department of Anthropology,
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velopment of a country. In North America it was the fur-bearers, chiefly the beaver, that caused the early trappers to move west and north into the unknown and thus pave the way for settlers to follow. In East Africa it was the elephant. The demand for ivory was so great and the price so high that when the elephants became scarce near the coast, the hunters pushed farther and farther into the interior searching for the big tuskers. Traders in slaves and ivory already had established routes from the coast into the interior, and these routes opened the way for the early explorers. Later, missionaries followed these trails and established stations as far west as Uganda. In 1901, the Mombasa-Uganda railroad was completed from Mombasa to Kisumu on the shores of Lake Victoria, thus opening up this country. The railroad offered inducements to settlers, and as the climate of the highlands was found to be healthful to the white man, people of all types and occupations moved in. *Tales of the African Frontier* gives a very good account of some of these people who were instrumental in the colonizing of this vast country. Each of the fifteen chapters is devoted to the account of the life of one individual, and it is of interest to note that most of these persons appear to have had a different reason for being in Africa. The book gives a history of the country from 1867 to the present day.

J. A. Hunter, the well-known game warden of Kenya and the author of *Hunter* has spent many years in Africa and personally knew many of the men of whom he writes. Daniel Mannix spent six months traveling in Africa interviewing the pioneers or their descendants. They have co-operated in producing a book that is historical and authoritative and makes most interesting reading.

T. DONALD CARTER

THE WILDERNESS WORLD OF JOHN MUIR

- - - Edited by Edwin Way Teale

- - - Illustrated by Henry B. Kane

Houghton Mifflin, \$4.50

332 pp., 8 line drawings

HOUSES and factories are built, clothing, machinery, and microscopes are made, food is stored, colleges founded. All this is tangible wealth that contributes to our well-being. But is it as essential as the written word that remains in books, where one may look for the accumulated knowledge of mankind? Men come and men go. It is through the pages of books that the spirit and vision of those who have gone before still speaks.

This book comprises a selection of the writings of the naturalist John Muir, fittingly chosen by a distinguished naturalist of today. We know of no one better qualified than Mr. Teale to make such a choice, or one whose running comment on Muir's



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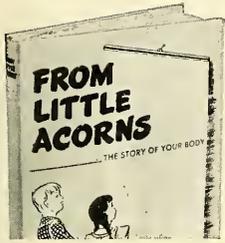
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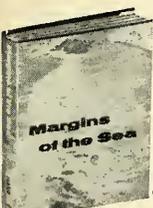


FROM LITTLE ACORNS

The Story of Your Body
by Frances W. Butterfield
Pictures by Dorothy M. Weiss

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The wonder of evolution as seen along the shore

Margins of the Sea

by **MAURICE BURTON**
Marine Zoologist, British Museum

■ The tidal zone of the world's sea-coasts has provided the testing ground for life progressing from sea to land. Exploring afresh various forms of marine life found along the water's edge, to place them in the perspective of evolution, Dr. Burton considers how they have met the physical obstacles of the tidal region. This book provides an absorbing journey among creatures familiar and unfamiliar, each of which in structure and function reveals a specific stage of progress in the race for the shore.

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life and personality would be of greater interest.

Its title is happily chosen. In the 1870's, the vast western mountains and forests, with their glaciers and torrents, were comparatively little known. Muir traversed them alone, on foot. "All he needed to do to get ready for an expedition... was to throw some tea and bread in an old sack and jump over the back fence... While in the wilderness, he declared, he lived on essences and crumbs, and his pack was as unsubstantial as a squirrel's tail."

The grandeur and beauty of the wilderness were his life; tasting of them was his adventure; seeing them through his eyes is the reader's privilege in this book. He had the naturalist's seeing eye for a squirrel, a bird, or a flower, details that fitted into the grander, wilder picture he loved and sought to learn about. His chapter on the Water Ouzel has been called "the finest bird biography in existence," and it certainly has ornithological merit, as well as being of his best descriptive writing. For him this bird's special appeal was doubtless its association with mountain torrents. He writes:

"The waterfalls of the Sierra are frequented by only one bird—the ouzel or water thrush (*Cinclus Mexicanus*, Sw.)."

JOHN T. NICHOLS

THE SUN, THE SEA, AND TOMORROW

— by F. G. Walton Smith and Henry Chapin
Scribner's, \$3.50
210 pp., 22 figs., 3 tables

THIS is a much needed book. It is a direct answer to those who, since the appearance of *Road to Survival* and *Our Plundered Planet*, have been calling the authors alarmists. When pressed, the optimists always fall back on the stock argument that we can eventually obtain from the sea everything we need to support a virtually limitless number of people. Despite their talk of substitutes and more synthetics from oil and coal, the authors of a recent book, *Road to Abundance*, lean heavily on what they term the inexhaustible sources of the sea.

The practical problem of just how the sea is to be mined to take care of our mineral needs and how its plankton are to be harvested to supply our need for energy and organic raw materials is usually glossed over. After citing a certain number of modern man's quite remarkable achievements in the fields of chemistry and physics, the optimist asks us to have faith that some miracle will suddenly reveal how we can achieve mastery over the oceans.

The great merit of *The Sun, the Sea, and Tomorrow* is that it clearly indicates what a long, long way we have to go before any of the Sunday supplement dreams become realities. By way of introduction

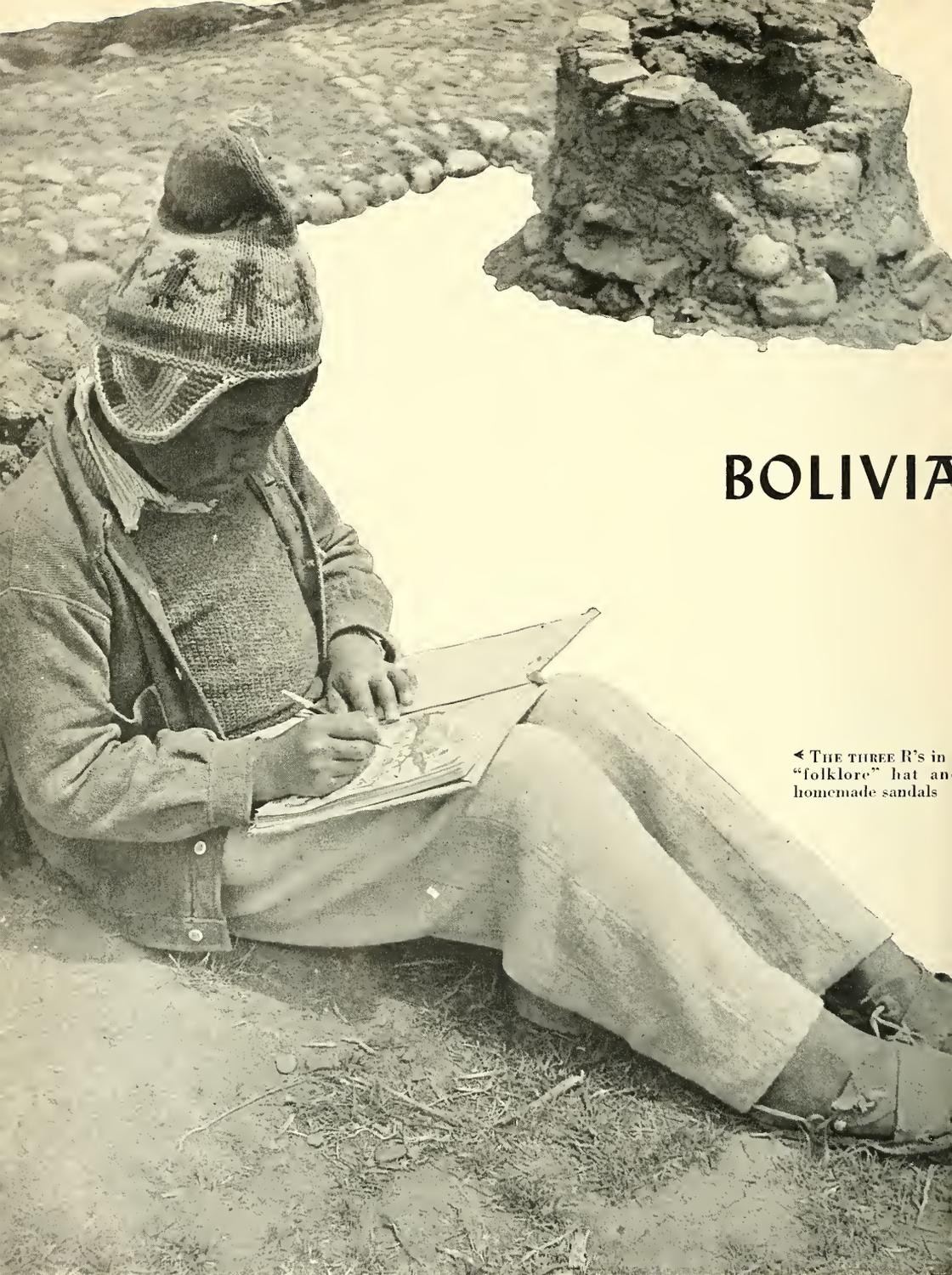
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BOLIVIA

◀ THE THREE R's in
"folklore" hat and
homemade sandals

I bought the painting of a red duck straight off the easel from Miguel, the Aymara youngster, who had obligingly moved out to the patio of his school and gone into a creative mood for our cameras. We were visiting the Indian normal school at Warisata, near Lake Titicaca in Bolivia, and had met Miguel in a classroom of the elementary school where the student teachers do their practice teaching. With his straight black hair, his concentration on the painting, and his solemn courtesy when we asked him to turn this way or that, he seemed to me the very child Jaime Men-

doza was seeing when he wrote, "In the Bolivian child the territorial spirit is at work. Here are the mountains, the rivers, the forests, all the physical being, elemental and tremendous. Here is the ancestral spirit, the soul, and, finally, like the soul of the past, here also is the soul of the future."

On a trip to La Paz, I became acquainted with some of the educators working in the U.S.-Bolivian educational program, and they invited me to go along with them to the normal school, where they spend most of each week, to see what they were doing. Becky Bern-

hart, specialist in elementary education, felt the lure of foreign service one cold winter's day in Battle Creek, Michigan. Bligh des Brisay, who has wandered down from Nova Scotia by way of Columbia University, has a degree in arts and crafts, while Chester Parks, who hails from Missouri, has specialized in vocational training. Lee Romero, out of New Mexico, is a social service worker.

Lee startled me that first day at the normal school by exclaiming, over her shoulder, "The Amautas are coming." The Amautas were the wise men in the days of the Incas.

Adventure in Learning

Through inter-American co-operation, the schoolhouse is becoming the hub of community life and the future is taking on a new look

By HAZEL O'HARA

All photos by Alberto Tardío M.



THIS TRACTOR is teaching more efficient farming at Warisata on the high plateau. Bolivia looks to the day when it can clear its vast jungle lowlands for agriculture



➤ SEWING lessons are part of the adult education program in home improvement



America by the Institute of Inter-American Affairs in 1942, when the United States was worried about holding the hemisphere together. Today, the Institute has technicians in agriculture, education, and public health working in Bolivia. When these experts feel in the mood for metaphysical discussion, they can argue as to which of these works comes first, but in reality they are all of first importance to Bolivia.

This country is like a family that depends for a living on a hardware store. If business fails, they can't eat the hardware. The very name Bolivia is synonymous with tin, but as these words are being written the price of tin on the world market is below the cost of production, and the nation is almost broke. Worst of all, Bolivia is dependent on other countries for meat, rice, and wheat. Milk cattle are scarce in the high altitudes, and when the stores in sky-high La Paz hang out the little slate that says canned milk has arrived, the lines quickly form, and some clerk you know in an office may ask you to get some for his family if you have a chance.

We can blame geography for much of the hardship, though blame is hardly a word you feel like using as your plane sweeps over the Western Cordillera and floats down beneath a line of snow-clad giants onto the great plain. You and your fellow-passengers look like queer birds in your yellow rubber oxygen masks.

Bolivia with its 416,000 square miles is almost the size of Washington, Oregon, California, and Colorado combined, and it has as many people as those states did just after the turn of the century. It is a big country to be landlocked. About 70 per cent of Bolivia's land lies east of the mountains, in the form of hot lowlands that produce sugar cane, rice, coffee, cotton, and cattle. There is also a lot of jungle that might be cleared for agriculture. Only one-eighth of the total population lives here in the lowlands, and the products of the area must be taken up the big hills to the mountaineers. Fresh meat is car-

What could be happening in this rarefied atmosphere, 14,000 feet in the Andes?

I rushed out to the upper porch and watched them gathering in the patio, men wearing those soft, fawn-colored ponchos of alpaca wool. On their heads were the bright knitted caps with ear flaps. Then I found out that Amautas today are the leading men in the communities and that they are invited to conferences at the normal school dealing with local problems. I had wondered secretly how a modern social service worker—a young woman at that—could relate herself to the ancient social system of the Aymaras, but Lee is accepted by these reserved men as someone worthy to take part in a conference. Those who can speak Spanish talk things over with her, and she is studying Aymara to be able to talk directly with more of them.

Lee is consultant to this normal school. Her job is to help the students to apply their sociology and psychology and other subjects to

the life about them, so that when they graduate and go out to teach in the little Indian villages, they will have the understanding needed for their work. Without this training, most of them could teach little more than reading and writing. And though some say that as many as four out of five of the people cannot read or write in Bolivia, reducing illiteracy is only a beginning. The deep problem of this fascinating and spiritually storm-tossed country is to pull its people together into a population of some homogeneity and to equip a large group with the diverse skills that will broaden the economy of the nation.

Growth of Plan

The United States is offering technical co-operation with the governments of other countries to aid them in improving their economy, with the fundamental purpose of steadying our civilization. Technical co-operation as a diplomatic maneuver was started in Latin

ried daily by plane to the cities of the highlands, but often during the rainy season (November to March) the pilots cannot cross the Cordillera. Then the headwaiters in La Paz hotels apologize for meatless menus.

Vast Uplands

High valleys like the Cochabamba, which stretches at a mere 8000 feet above sea level between the Central and the Eastern Cordillera, support large populations. Thousands of people live up on the Altiplano—the high intermontane plateau—at 13,000 to 14,000 feet, with their heaviest density around Lake Titicaca. This tremendous plain on top of the world has the grandeur of infinity. When you see some bits of bright red moving across the immense flatness under the arch of the sky, you can scarcely believe they are shepherd girls.

The alkaline soil is dry a great part of the year, and nothing like a good hot night ever comes on the Altiplano. The main crops are quinoa (a high altitude cereal), potatoes, and barley, with some broad beans, wheat, and corn around the southern rim of Lake Titicaca. The livestock are llamas, alpacas, and sheep, plus some pigs that have a rather peaked look, as though life were not easy for them in these high places. All in all, the Altiplano is a grudging homeland. Many have quite naturally thought of the same obvious solution, which would be to shift the people from the high altitudes to the lowlands on the other side of the Andes. There they could clear the land and raise loads of produce that would help solve their own economic problem and that of their country.

There's an obstacle, though, and it's higher than the Andes. It's the love of the people for their high, cold, austere plain. I have heard that Indians returning from the Chaco War, which was fought in the hellish hotlands at the heart of the continent, have wept when they saw their snow-clad mountains again. Myself, I have felt the spell of the Altiplano, as, on waking one



▲ COUNTRYMEN meet to discuss school problems. Three hundred of them came to watch when the students gathered their first alfalfa

➤ BARREN though it is, the Altiplano provides high quality materials for weaving. A scene in the Llica central school

▼ SUPERVISORS and pupils inspect the eucalyptus and pine seedlings raised at Llica for distribution to sectional schools in an effort to increase forest growth



night at Warisata and propping myself on an elbow on my cot beside the window, I looked out upon the roof of the world flooded with moonlight.

The holy city is up there, too—Copacabana on the shores of Lake Titicaca. Pilgrims in Inca times used to stop here on their way to the Island of the Sun. Pilgrims in our times come barefoot over the stony road to keep their vows there to the Virgin of Copacabana, a dainty little figure in her private chapel upstairs at the back of the high altar.

Nor do these highland folk feel so well down below, for they are adapted to the altitude and have larger chests and an outsized heart. They trot their goods great distances to the markets of the Altiplano. On Thursday, the flat plain outside the normal school at Warisata is already bright when we get up in the morning. In the old mining city of Oruro, we see the tall white Mother Goose hats of the Cochabamba women,

who have brought their goods on the 16-hour train ride over the Central Cordillera or have come in trucks over that dizzying highway. The nation hopes some day to have the roads and rails that will tie its chopped-up parts together, but construction, of course, is fabulously expensive.

In the meantime, efforts are being made to help people improve their condition in the places where they are already living. The joint educational program between the United States and Bolivia is conducted by an agency created for the purpose—The Servicio Cooperativo Interamericano de Educación, commonly known as SCIDE (See-Dee). It is a part of the Bolivian Government, which contributes most of the budget. The United States puts in a token amount and supplies technicians, one of whom, Dr. Tom Hart, a seasoned educator, is Director of the SCIDE. So far as possible the North American technicians (rural education, agriculture, arts and crafts, vocational education, home life, and social service) are paired with Bolivians in the same field, but this arrangement is not always possible, owing to lack of trained Bolivians.

The group's main activities are in rural education, where the big job begins. The population of Bolivia is largely rural, and perhaps 85 per cent of the people are Indian or mestizo. A more precise demarcation seems impossible to secure, for people talk of clothes rather than of race, saying that this woman is "de pollera" and another "de vestido," the one wearing the bright voluminous skirt of the Indians, the other, store clothes that put her among the mestizos. At any rate, in this country, Indian heredity is dominant, and there are many villages in which the people speak either Aymara or Quechua and only a few know Spanish.

Teachers Study in U. S.

The nation plans to carry out a general educational reform. SCIDE's effort to make the rural schools a creative force in the community should help vitalize this reform. The existing schools are organized into groups of 15 or 20 operating under the direction of a central school. The sectional schools are usually little one- or two-room adobe shelters with dirt floors, with the children bunched together on a few benches in the semitwilight.



▲ THE WONDERS of learning to read

▼ HATS are made from local straw in the Ucurena central school



The teacher tries to pass information from his memory into theirs, without any of the props that make learning colorful. The Ministry responsible for rural education has given SCIDE the supervision of 5 groups, which include 113 schools with 5300 pupils and one normal school. At various posts in the demonstration, I met the nine rural teachers who were sent to the United States on scholarships for a special course of study given at the University of Maryland in 1952-53. At the Warisata normal school, Adriana Baspineiro, the only woman among them, teaches home life; José Valencia teaches arts and crafts; and José Barriga, mathematics.

This Indian normal school is the heart of the demonstration. It is a two-story building in the colonial style, built in a square around a patio. The student teachers, mostly men, have stocky bodies and strong dark faces bespeaking an inner dignity.

The curriculum of this normal school is being revised little by little to focus it upon local life. Manual skills have been elevated into courses that complement the academic and round out the teachers' equipment. "The rural school,"

someone explained as we visited the shops, "must turn out boys who can mend a plow, put windows in their homes, and build a bench to sit on." Student teachers make wastebaskets, chairs, racks, and other articles needed in classrooms and dormitories. In arts and crafts they try their skill at creating fine things out of local resources. The Altiplano may be grudging, but it does offer reeds and straw for baskets, hats, and mats, and clay for pottery. As for rugs, blankets, and other weaving, no animal offers more beautiful wool than the alpaca. Children in the demonstration school are hammering, modeling, and weaving, and some are revealing real talent. The rural schools by this kind of training can do much to create the artisans and encourage the small industries that can enrich the barren seasonal economy of Bolivia's lofty Altiplano.

Home-life instruction is also given. At Warisata, men and girl students alike take their place at the sewing machine, learning to make and repair clothes. They go to the kitchen to apply their knowledge of nutrition in the preparation of meals. The hygienist is teacher and first-aid man for the people. Every pupil in the rural schools

supervised by SCIDE has been given a course in first-aid and simple medical assistance.

Willing to Walk 30 Miles

The agricultural program of this normal school, kept within the limitations of the Altiplano, is winning the curiosity and then the respect of the *campesinos*, a word that means countrymen, without including wealthy farmers as would be implied in English. One morning at Warisata I met one of them, an Amauta, who had walked 30 miles to the school to get seeds and seedlings. The school is introducing fodder crops, for natural pastures are not rich up here on the plain. When the students gathered the first alfalfa, about 300 *campesinos* came to watch, and some of them made off with a handful to try out on their animals. A big crowd gathered the day the school's new tractor was blessed and declared ready for business. The agricultural course extends through the four years of normal school.

A springtime mood animates this school. A youthful quest is on, and everybody seems excited over one thing or another. The school even seems in danger of losing its special Indian character, for students are coming from all regions of the country. The enrollment, now in the seventies, is straining the old building, and classes meet out on the plain. A handsome new building with entrances of carved stone in Indian designs is nearly finished and will provide bright classrooms for both the normal and elementary schools, as well as space for entertainments and dances.

The enrollment of the elementary school jumped from 200 to 350 in one year. This is not surprising, as the pupils like the place so well they hang around after hours. Most startling was the increase in girls, from 20 to 75. Girls have always had to tend the sheep and llamas from the time they could walk, but now the Amautas are sending their daughters to Warisata and are bidding them to attend well to the home life courses. Members of the 4-H Club

▼ CHILDREN buy paper and pencils for a small sum at Kalaque





▲ WASHING up for lunch: a requirement taught by the hygiene instructor



▲ IN THE PATIO at Llica, girls help to prepare lunch on raised stoves instead of on the earth where their ancestors used to do it

▼ OFF to the playground for a bit of fun at Warisata



▼ DEDICATING a water system built at Llica by the men of the land with the help of Inter-American Co-operative Service supervisors



in the elementary school have planted 900 eucalyptus and pine trees to beautify the school grounds and to see what can be done to reforest this nearly treeless plain.

"Co-operatives, of course, are nothing new on the Altiplano," Dr. Hart hastened to explain. "This has been an ancient agricultural civilization up here, and they have been marketing for a long, long time. What we hope to do through the 4-H Clubs is the same thing that they do in the States, and that is to create what you might call a group of young professional farmers."

Hand-built Schools

The *campesinos*, both men and women, are rallying around the schools and are joining the clubs. When another building was being put up in the Kalaque area, the women came with their clay canteens to carry the water needed to mix cement. The men are learning to make window frames in the school's shop and to set glass. Señor Angula, the director, a gay, lithe, talkative man and one of the nine who studied at the University of Maryland, took us on a brisk walk up the brown lanes to a cluster of little adobe homes to show us his

prize exhibit—a stove and a flour mill, which he had built with the help of the teachers in order to get the cooking off the dirt floor.

From each central school, the demonstration stretches out to the sectional schools, many of which become inaccessible when the rains set in. Often, too, they are sad little affairs, and I wondered how a man could whip up his enthusiasm every morning for handing on the accumulated knowledge of mankind. SCIDE holds periodic workshops in each center—two weeks at a time—and to help the teachers, circulates a team of traveling supervisors, one in hygiene and one in agriculture. Both of these men were also among the nine who went to Maryland; and a third member of the team, the supervisor in elementary education, is now in the States for his year of advanced training.

One day in October, Dr. Hart announced to his technical staff, "I want everybody to get down on a visit to Llica before the rains start." Llica is a village some 300 miles south of La Paz on the Altiplano, and I was delighted that there would be room for me in the caravan of two jeeps and a truck. The latter, topped by bulging canvas, carried our cots and bedding, groceries and portable stoves, pots and pans, lanterns, extra gasoline, and some supplies we were taking to the school.

We spent the first night in Challapata, a brown little town huddling close to the earth under a flaming sunset. In the box-sized dining room of the country hotel, an Indian boy with slant eyes waited on us, standing with his hands folded into his sleeves Chinese fashion. Leaving at 7:00 the next morning, we fell in with a desert in about two hours—the real thing, complete with mirages of lakes in which long-legged birds were wading. For an hour and a half we tried to find our way out. We saw the pink skirt of a shepherd girl and chased across the sand in our jeep, catching up with her beside an oasis with some llamas. Our driver questioned her in Aymara, but she sheltered the child beside her from our strange faces and

could not help us. Finally, a faint pair of tracks led us through the bushes and over a little hump to a village, where men and boys happily jumped on the running boards to ride with us to the next crossroads.

In the Department of Potosi along in the afternoon we passed through territory that looked like some ancient volcanic playground—a land of huge porous rocks tossed carelessly about. Afterwards I read that the remnants of a tribe of Indians named Chipayas live somewhere in this desolate region between the Cordillera Volcánica and Lago Coipasa.

All that second day we met no car or truck and were alone in this part of the universe with llamas, alpacas, some astonished vicuña, and a few foxes. We did meet an occasional man on a bicycle and caught up with a mailman who accepted a ride in the truck bearing our household goods. We were intrigued to hear our driver call him a *Chasquis*, for that word in Inca times was used for the runners who carried official messages and tied the vast empire together without the aid of a wheel. We left him in the little town of Salinas, where he trotted around the plaza blowing through a shell to summon the people to come get their mail.

Llica

After about an hour of salt flats, somebody said, "*Estamos en Llica*," and we were there. The schoolhouse stood in open country, a two-story building with a porch along the front of each story. Director Luis Pérez, a dark, quiet little man, appeared out of the sunset to welcome his dusty guests as they stumbled from the jeeps. SCIDE's itinerant supervisors, Alberto Torranzos and Héctor Ramírez, were both on hand, and good fellows they were, helping us put up our cots, fill our lamps, and set up housekeeping in a big bare room with a ping-pong table.

In broad daylight, Llica proved to be a plain little huddled brown village, sidetracked in a treeless

land. Though they talk of a rainy season, not enough rain falls in the course of a year to keep them out of the dust. Water is scarce and salty enough to flavor the coffee. The only wood for carpentry or other uses is furnished by the cactus, which stands loftily about in steep places. Crops are *quinoa* and potatoes and little else. Meat is scarce, and it's a mercy that *quinoa* is a pretty good protein cereal, having all ten of the essential amino acids.

But Llica is a stouthearted little community with a tremendous respect for learning. Señor Torranzos, the stout, bluff supervisor in agriculture, and Señor Ramírez, the lean, gentle supervisor in hygiene, both said that for all the barrenness and poverty, they had never worked so happily as in Llica.

The people are Aymará, and though up around Lake Titicaca the Aymará seem withdrawn and suspicious, here they are an outgoing people and friendly, though I must say they are without mercy on the tender feet of an office worker. The day after our arrival, we puffed and trudged under a hot sun at nearly 14,000 feet above sea level until exhausted. The children came in two's and three's and found us sufficiently amusing to stay and giggle, as we dashed out with our cameras to take photographs.

Señor Torranzos and Señor Ramírez came by to take us down to see the henhouse under construction, and both took a hand in helping the students to hang the door to the yard. Señor Torranzos then led us off to see the beds of eucalyptus seedlings and pine which are being raised to send to sectional schools where there is more rain. He told us that he and the agriculture teacher had experimented with compost plots at Llica, using sheep's manure, and had demonstrated that with a little care they could raise more *quinoa* and of a better quality. The school, which has 20 boarding pupils, is nearly self-sufficient in agricultural products.

We went on a DDT call with Señor Ramírez and one of the

Continued on page 476



When WINTER

Frazil

YOSEMITE

A cone weighing thousands of tons forms beneath the Falls, and one sees the strange phenomenon known as frazil ice

By FRAN HUBBARD

*Photographs from National Park Service
except where otherwise indicated*

THE magnificence of Yosemite Falls has thrilled thousands of visitors to the Park. Relatively few, however, have seen or heard of the spectacular displays of ice that the Falls produce during cold weather.

Winter rains, ice dropping from

the cliffs, and freezing temperatures usually combine to build the huge and spectacular cone of ice shown here, at the base of the Upper Fall. The cone has grown to as much as 322 feet in height, with an estimated volume of 25

million cubic feet. It is at least partly composed of what is known as frazil ice (pronounced fray-zil).

The word "frazil" refers to ice crystals floating in a body of water. The term comes to us from the French Canadians (from French

▼ THE HUGE ICE CONE that forms at the base of the Upper Fall can be viewed by the visitor from various vantage points. But only skillful climbers should scale

its slopes. The cone is formed partly of droplets of water that froze while falling and partly of what is known as frazil ice crystals

Yosemite Park and Curry Company photo





ACCUMULATION of frazil ice in a stream can divert its course and flood surrounding country, as shown here near Yosemite Creek. A rotary snowplow was necessary to remove the ice from this road in April of 1953. If not

cleared promptly, the ice can harden, making removal much more difficult. Yosemite's Upper Fall is 1430 feet high. There is an intermediate cascade of 675 feet. The Lower Fall adds another 320, making a total of 2425 feet





▲ THE MILKY APPEARANCE of a stream in winter is sometimes due to thousands of tiny crystals of frazil ice, which form when a sudden drop in the air temperature causes a slight supercooling of the water. Especially when the water loses its motion, the crystals tend to adhere to one another

frazil, "cinders"). Crystals of this type form in turbulent water only when a slight supercooling of the water is produced, generally by a sudden dropping of the air temperature to well below freezing. Individual crystals start as very thin, flat, round discs. They grow in size to about a tenth of an inch in diameter, at which time, in slowly moving water, branching extensions grow around their edges.

The crystals will move along in swiftly flowing streams, looking like finely ground, milky ice. They range from around 1/250th to 1/1000th of an inch in thickness, and they are apparently attracted to rocks and masses of ice by forces attributable to adhesion and capillary action. Freezing may later attach them more firmly. The giant cone is partly composed, no doubt, of crystals that are not frazil ice but were formed when droplets of water plunged over the Fall and froze.

Frazil ice lacks the grinding force of regular ice in a river, but it is dangerous from the standpoint of causing streams to overflow their banks and change their courses. Along Yosemite Creek, which flows into the Merced River about a mile from the base of the Lower Fall, the ice has sometimes reached a depth of more than 20 feet. The trails have to be opened with snow removal equipment once the formation of ice has ceased, but on either side the ice may remain for many weeks. Explanatory signs are placed by the Park Naturalists to help the visitor understand its origin.

In April, 1953, the stream was diverted onto the road beside the creek, and a rotary snowplow was necessary to clear it. Where the lower footbridge crosses the creek, the ice rose high enough to buckle the bridge and shift it from its foundations. The flow was finally broken by the use of explosives and

powerful streams of water from a fire pump. The 1954 flow completely filled the stream bed, covering the large footbridge near the Lower Fall with many feet of ice.

Visitors to Yosemite may view the ice cone during winter and early spring from vantage points on the valley floor. The Park is becoming increasingly popular among winter enthusiasts. Two major highways are kept open. Visitors can stay at Yosemite Lodge or Ahwahnee Hotel, but reservations should be made in advance. There is ice skating on the valley floor, and the Badger Pass ski area has a cafeteria for the convenience of vacationists.

Hardy climbers equipped with ice axes and crampons have been able to ascend the cone by chipping footholds. Such activity is not without danger. A misstep in climbing could mean disaster, and warming of the weather can release tons of ice from above the cone and bring it thundering down.

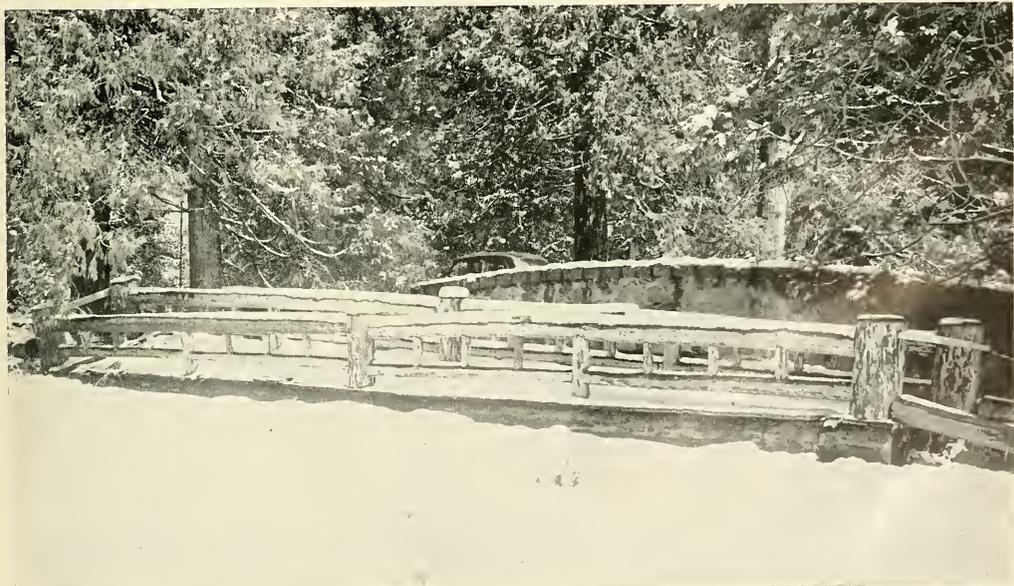


▲ As visitors usually see it, the bridge below the Lower Fall is well above the stream. It was completely covered by the 1954 frazil ice flow, and the post beside which the author is standing is the same as the one barely visible in the adjacent photograph



▲ BURIED beneath an accumulation of frazil ice in March, 1954, the bridge was invisible except for the post in the foreground

▼ THIS LOWER FOOT BRIDGE across the Yosemite Creek was moved from its foundation by the ice flow of April, 1953





George A. Grant photo, courtesy of National Park Service

▲ THE POINTED LEAVES of the desert holly turn a delicate dusty silver after the blooming season. These examples were photographed east of Stovepipe Wells

The Holly OF DEATH VALLEY

This rare desert plant was almost eliminated by tourists who could express their appreciation for beauty only by destroying it

By EDWARD A. HERRON

CALIFORNIA's Death Valley has inflicted such suffering upon men that it is easy to overlook the other side of the story. It is easy to forget the near-destruction wrought upon Death Valley by men.

On the smooth, mile-wide gravel fans pouring dry from the narrow lips of waterless canyons, there were once carpets of the lovely desert holly. As late as 1918, it was present

in abundance. Fifteen years later, the work of ten million years had been nearly undone. The beauty of the holly of Death Valley was its undoing.

Death Valley is a desert within a desert, and for a plant to survive there, is something of a distinction in itself. The American tourist sees few places so awesomely barren. All the way from the eastern entrance

to the final moment of exit along the alluvial slopes of Emigrant Wash over by Stovepipe Wells, the region appears to have surrendered itself to sterile desolation. Towering ranges of bleak mountains flank the Valley on either side, only four to sixteen miles apart. The glaring white floor of the Valley, looking as though it had been brushed flat for 140 miles between these ranges, is

a mosaic of sand, rock, salt, borax, boulders, gravel, lava, and clay. Occasionally a run of bitter salt water rises and disappears. No land more hostile to the growth of living things can be envisioned.

But the holly of Death Valley is as tough as it is beautiful, and through the ages it clung stubbornly to life in the dry gravel beds, seemingly indifferent to the harsh alkaline soil. Summer temperatures that reach 134 degrees in the shade and 156 degrees in the sun did not wither it. It survived the furnace heat of summer and the threat of death from almost complete lack of water. A normal year sees slightly over two inches of rainfall in the Valley. Less than one-tenth of an inch has been known to fall in a bad year. But the holly survived.

In the first 50 years after the discovery of Death Valley, hardly 1000 persons, are estimated to have descended to its floor, 279.6 feet below sea level. A thousand men, creeping through half a century, were hardly a threat to the plants and shrubs that had fought successfully through the ages in a rainless furnace. Man on foot, plodding behind a laden burro, was never a menace to Death Valley. But man in an automobile was more than the holly could stand.

The desert holly is a compact rounded shrub, scarcely three feet at its tallest. After the meager taste of rains that sometimes fall in December, January, and February, the leaves are thick and of a greenish tinge, while its flowers are yellow. After the blooming season, the sharp-pointed leaves become a delicate dusty silver, intermixed with browns and grays. The seeds, bursting in the sun, are a spectacular red.

Most of the tourists no doubt respected the plant for the wonder that it was, but an unwholesome percentage leaped upon it, ripped it up roots and all, and crammed the silver beauty in vast drooping heaps between fenders and hoods. Outbound automobiles were decorated like Christmas trees. The holly had fallen victim to the hoards who could only express their apprecia-

tion for beauty by destroying it.

The plunder was ruthless, and by 1933 the desert holly had all but disappeared from Death Valley.

In that year, the law came on the side of the beleaguered shrub. Congress established Death Valley National Monument. Ranger check stations were established at the two main exits, and the departing tourist was seriously limited in his decorative tendencies.

As a result, T. R. Goodwin, who has been superintendent of the National Monument since its beginning, says that the desert holly is regaining its lost abundance. After 20 years of tourist traffic, after winter week ends that have seen as many as 50,000 in the narrow Valley, Superintendent Goodwin believes that the plant life today is

just as abundant as it was in 1939.

Each winter is a time of waiting for the seeds that fall between the Panamints and Funeral Mountains. Protected by a hard shell, they can stay dormant for as long as 20 years. The seeds may seem dead in the ground, but a dash of rain in December will give them the proper start for life in Death Valley. More rain must come in January and February to establish the root system before the first onslaught of heat that arrives in mid-May. But the desert holly, like the creosote bush, the mesquite, the primroses, and the poppies, can survive the heat and thirst of Death Valley to lend its charm to this extraordinary spot, if only it is protected from the greatest menace of all, man himself.



Catbirds with two lives

The chicks could not have known they were swallowed
by a snake, but they lived happily ever after

By G. C. CHRISTMAN

EASTERN PENNSYLVANIA'S beautiful Perkiomen Valley can boast of what is probably the most unusual pair of catbirds that have ever taken wing. It is not impossible, in fact, that their record is unique in the animal kingdom, for they were once eaten by a black snake, an experience that can usually be depended upon to be fatal.

But these two blithe little inhabitants of a pleasant wood along the upper reaches of Perkiomen Creek, in upper Montgomery County, succeeded in surviving the ordeal without a single adverse effect. Partial credit for this must go to the fact that the snake dined on them very early in their lives.

But there was one other fortunate and all-important circumstance. This was the presence, at just the right moment, of a nature-lover, whose human instincts quite transcended his appreciation of the normal processes of nature.

Harold Faut had been taking a morning stroll through the wood when he noticed a black snake stretched along a low-hanging limb. The head of the snake was out of sight in a bird's nest. As Mr. Faut watched, he noticed a small bulge run along the body of the snake, closely followed by a second.

A blow with a stick brought the snake writhing to the ground, and a deft stroke with a knife severed its head. Quickly, then, but carefully, he drew the body of the snake through his fingers, working the two small bulges toward the headless end. A bird's egg popped out, then another.

Seeing that the shells were intact, Mr. Faut wiped the eggs dry with his handkerchief, carefully replaced them in the nest, and went his way.

Daily thereafter, Mr. Faut visited the nest. He was finally rewarded with the sight of two squalling, open-mouthed fledglings. He continued his visits until satisfied that the baby birds were safely on their way to adulthood.



*Drawing by
Robert Cartland*

Wild Dog OF AFRICA

Its cunning, speed, and endurance are as fatal to its prey as the bullet, and even its distant cry will throw the animals of the veldt into panic

By WYNANT DAVIS HUBBARD

How terrible can be the fear caused by wild dogs was shown to me one night when I was camped far out on the veldt in a little-known area west of Nanzila, in Northern Rhodesia. Fifteen natives and I were camped on a little slope a few hundred yards from a shallow, lily-covered pool. Full of meat and tired from the long day, we were in that comatose condition immediately preceding heavy sleep.

Suddenly, out in the dark, the shrill, yipping bark of a wild dog silenced the orchestra of small night sounds of the veldt. Another cry, then others.

I sat up to listen. There was no reason to be afraid, although the barks were harsh and menacing and unpleasant. So far as I know, wild dogs have never attacked a camp of men. In any case, my rifle was within reach beneath the blanket.

As I listened, it became clear that the quarry, whatever it was, was

heading our way. The shrill sound of the chase came closer and closer. Some of my natives sat up. Mangineera, my half-pygmy and devoted gunbearer, rose and came to squat beside my grass bed.

Silently we stared into the darkness, although we could see nothing beyond the faint rosy glow from the dying cooking fires. Then, with our ears tuned to catch the faintest sound, we heard the splash of water. The quarry had reached the pool and rushed into it for refuge. But we knew that it was, at most, eighteen inches deep. Listening, we expected to hear the horrid sounds of slaughter and the piteous cries of an animal dying as it was torn, living part from living part, and eaten alive.

Instead, the cries of the dogs increased in volume and began to move. Within moments we heard the pounding of hooves and then the heave of labored breathing. I

yanked the rifle up and held it ready. Something was rushing at us out of the night. All the natives were up, several holding spears at the ready.

Abruptly a hartebeeste burst from the night and raced into camp to stand with heaving sides and lolling tongue not far from where I sat and within the glow of the fires. All around us, the wild dogs yipped and barked and growled as the pack split to pass on each side of camp and circle around.

The natives would have speared the poor hartebeeste then and there, but I forbade this. Desperate and near exhaustion, the hartebeeste, after trying the water for safety, had come to us. The least we could do was to honor its trust and hope.

The dogs stayed about the camp for nearly an hour. I could pick up pair after pair of gleaming eyes with my flashlight but did not shoot, for the crack of the rifle would have

sent the hartebeeste flying to meet death within a mile.

When I fell asleep after the dogs had gone, the hartebeeste was standing quietly by the fire not three yards away. When I woke in the false dawn, it was gone. I promised myself that I would not shoot a hartebeeste as long as we were in the territory of the one that had joined our company and found protection among us.

The wild dog is the only animal of the veldt that is always feared. The lion is not. Many a hunter has watched a full-fed lion walk in plain sight of a herd of antelopes or zebras without its arousing more than casual interest on the part of the animals that form its natural prey. The game seems to understand that lions kill only for food and from necessity, or to teach their young, and never just for fun.

How antelopes determine when a lion is satiated, very probably with the flesh of one of their former companions, is not readily apparent. Do they, perhaps, see and understand the heavy, rotund belly sagging toward the ground and the slow, deliberative walk?

Similarly, the mere sight of a cheetah or a leopard is not a cause for stampeding. Unless cheetahs are hungry, they do not hunt, and even the demon leopard will pass up game when fully fed or when it has an antelope carcass stashed

away somewhere in the fork of a tree.

Of all the carnivores, only *Umpi*—the particolored wild dog—causes immediate flight. His high, yipping cry, his scent, or his appearance can cause panic.

Fierce, with strong legs, tough feet, and an enormous lung capacity for the long chase, and armed with strong, thick teeth set in powerful jaws, the wild dog is more of a scourge on the veldt than are wolves on the tundra. Colored in patches of black and dirty white and a sort of burnt orange, *Umpi* is hard to distinguish in the grass until one of the pack, and then another, bounds above the concealing grass to look for game. Even when leaping into the air this way, the wild dog is so quick and its color so deceptive that it is hard to see.

A pack of wild dogs is on the move day and night. On occasions, hunters have found them lying down, but wild dogs are tireless. Their springy muscles are apparently always fit for one more mile of chase. It is in this way that they bring down even so large and powerful an animal as the eland antelope.

All wild animals, even the hippopotamus, can, when necessary, put forth astonishing bursts of speed. But not one can keep up this tremendous speed for any distance. For the long pull, all animals have

a canter, or a trot, or shuffle, which they can maintain hour after hour. If they are pressed hard and closely enough to cause them to break this mile-consuming pace and move faster, it is not long before they are blown and must pull up.

I do not know if wild dogs consciously take advantage of this fact, but after the first burst of speed has taken their quarry away, the dogs follow and press after it, never allowing it to settle into a jog, or trot, which would carry it for miles. Saliva dripping from their open jaws, yipping one to another in high, shrill tones, and leaping into the air to keep their quarry in sight, the dogs push on, running so hard that the terrified creature ahead must put forth all its efforts.

If the antelope can reach a water hole in which the water is three or more feet deep, it can dash into the water, whirl about, and face the dogs. They will not press the attack if they have to swim, although they will lie and stand at the edge of the water waiting for a long time.

Thus the water holes and ponds on the African veldt are not only the source of the drink that nearly all animals must have to survive; they are also, at times, a refuge. But it is only the wild dog that forces such a use, and it is only the wild dog that hunts habitually about a water hole and, except for the crocodile, kills in and near the water.

▼ A PACK OF WILD DOGS in typical stance. From a group in the American Museum's Akeley African Hall

AMNH photo



Threading

UTAH'S NEEDLES

It would be difficult to find either in art or nature a metropolis to rival these brilliant minarets of sandstone

By JOYCE ROCKWOOD MUENCH Photographs by JOSEF MUENCH

▼ GATEWAY TO THE NEEDLES. Erosion has carved gigantic sandstone figures in red and buff



THE CAVALCADE of jeeps that took the author into the country of the Needles in southeastern Utah. Here we see the walls of Lavender Canyon, a region not often visited but full of arches, caves, and other rock sculptures



▲ THE NEEDLES, delicately carved and strangely tinted. At right is the only "road" by which the inquisitive traveler can reach this area

EARLY western explorers who shrugged off much of eastern and southern Utah as of use merely to hold the earth together would be surprised at its present place in the limelight. From this blank spot on the map, which is still the largest section of the United States without improved roads, come announcements of uranium discoveries; and in it lies Dinosaur National Monument, whose fate is being decided in the Nation's capital.

While the battle rages in Washington over a dam which would destroy the beauty of Dinosaur Monument, the Green River continues to flow toward its dramatic junction with the Colorado River. The wedding is witnessed by soaring cliffs, and the area immediately to the southeast is one of our finest scenic spots, for it is the land of the Needles. It combines the majesty of the Grand Canyon with rock formations in even greater variety and—dare we say it?—even more color.

It was into this uninhabited land

of color and canyon wilderness that a party of us went not many months ago. If there had been a register to sign as we left Utah State Highway 95 (28 miles west of Blanding) or where we rejoined U. S. 160, we would not have found many pages filled. The ubiquitous cowboy, who seems to have ridden blindfolded and tongue-tied through much of the amazing West, has been there. So have a few geologists and archaeologists—tireless and enthusiastic but content to let their often lyric praise be buried in government reports. Only a handful of visitors, going for the pure and exciting fun of seeing new places, have explored this one.

Dr. J. S. Newberry, geologist to the MacComb Expedition of 1859, said the country was "impassable to everything but the winged bird," but that didn't discourage us, because he didn't know about the army jeep. In the hands of an experienced guide, the jeep has advantages over a "winged bird." It has room for more passengers, plus food and camping gear. In all the

200-miles of our meandering jaunt, we didn't see another person.

Leaving State Highway 95, we drove north on Elk Ridge through pines and aspens in the Manti-La Sal National Forest. We were traveling over a huge flat block that stretches 50 by 20 miles at an elevation of about 8000 feet. The Bears Ears stick up above it another 1000 feet. In winter, snow blankets the forest, but summer finds streams running, annuals and flowering shrubs in bloom, and the dry, clear air, pungent with pine and juniper—ideal for camping. You can fish, hunt, ride, and hike here in a "yellow and purple-corrugated world of silence," as Zane Grey described the canyon-desert lands.

On Horse Mountain, at the end of the Ridge, we had a 9202-foot platform from which to survey 20,000 square miles of canyons and lordly headlands. Kent Frost, our guide from Monticello, pointed out the territory we proposed to conquer. On the northeast lay Beef Basin, and beyond was the rocky



jumble of the Needles, with Junction Butte lording it over them and the La Sal Mountains on the horizon. Behind us, 11,445-foot Abajo Peak rose above the deep cut of Cottonwood Canyon. It was an "earthscapescape" never to be forgotten—too big to grasp except in bold outlines. An air view of this panorama would show a sublime simplicity, three splendid mountain masses that would be conspicuous in almost any region. From our lookout, the mountains were still dominant, but the plain achieved complex individuality. It was magnificent in its own right.

As we started down the slope, we knew we would soon come to grips with the reality of the canyons. Caught in a tumultuous sea of rock forms, we would be be-



▲ THOUSANDS OF FLOWERS live on the flats and give a parklike quality to the bottom lands. Note how small the trees look in comparison with the rocks

neath the great swell of the plateaus, deep in the troughs of a storm that our limited time sense pictured as stationary.

A Lush Camp Site

Aspens, white fir, and western yellow pines gave way to piñon and cedar, as the jeep took the drops to the flat dome of Beef Basin. We found ourselves in a green-floored sanctuary, fed by springs from several tributary canyons. The protective walls that hid us from the outer world gave no hint that they would deepen to a 2000-foot canyon before reaching the Colorado River. The bottom

land was so inviting, we half expected ranch buildings under the cottonwoods and a welcoming word from a surprised host. But the houses we found hadn't been built by any cattlemen. They were little stone huts, laboriously set up by the Anasazi, the Ancient Ones, who had been gone for hundreds of years. Perhaps their spirits still lingered in the valley, but only the soft silence greeted us. At least, when night fell after a long twilight of tinted rocks, slight stirrings in the dark around us caused us to look suddenly over our shoulders, but we were alone for all we could see.

There was no style to our camping setup. It was as unencumbered of non-essentials as the landscape. Each of us had a sleeping bag that during the day carried a change of clothing rolled in with it. A compact cooking outfit; dutch oven for occasional biscuits; canned goods served with the sauce of outdoor appetites; and big canteens of water sum it up almost completely.

The morning broke clear and cold, and we turned away from the junction of Ruin Canyon and Beef Basin Wash to strike north again across uncharted land. Government publications cover the section with only the words "Not Mapped," and no conspicuous landmarks soften their warning. For a while, the country was open, but before long we were on a roller coaster of rocky hills. It was rug-

ged going, even for the jeep, calling every so often for human ballast on the hood to keep the nose down. Sharp gullies and sudden drops occupied our attention, and the pace was probably no greater than that of the pioneers when they drove their covered wagons across the plains. We didn't seem to be getting anywhere, and then—there were the Needles. Ethereal as they looked, we knew that the spires and pinnacles were solid rock, and there was not the ghost of a break to be seen from one end to the other. We were blocked, unless our guide had some "Open, Sesame" to swing a gate in the Cutler Sandstone and let us enter this fabulous metropolis of minarets.

A Hidden Entrance

But the password "Erosion" had been invoked long ago, leaving a narrow cut we all but missed, invisible except close at hand. We slipped through with fingers crossed lest the bulky doorway close before our bumpers cleared.

Against the luminously brilliant sky, the Needles broke into splinters of color, banded in rose and cream, above a deep-piled carpet of flowers. Dr. Newberry had suggested that the island of Manhattan, thickly set with church spires, would come closest to resembling

the Needles, but he admitted there was really nothing anywhere to parallel these "singular objects"—either in nature or art.

The formations rise to several hundred feet in places, without any standard size or shape. Some are slender, as their rather inadequate name implies. Others are full-bodied.

There are heroic statues with caps of soft pink; crude likenesses of pioneer women, hooded monks, delicately pointed cathedral decorations. After a few attempts to characterize them, one gives up, leaving hundreds of individual shapes unaccounted for.

The battlements seemed chaotic above the flowered floor, but soon we noticed that they stood in semi-circles, as though forming a sort of rocky fence. A landscape architect with big ideas, or a crazed cattleman, might have conceived of such a plan. Actually, the design may reflect the meanderings of a stream long since vanished.

Parts of the flatland are so neatly covered with grass and sunflowers that you half expect to see a "Keep Off the Grass" sign. The area is appropriately named Chesler Park, after an old cowhand.

After making dry camp, we settled down for a fireside chat, which drifted to the geologic story



▲ THROUGH THE WILDERNESS: two of the jeeps tumbling down rocky ledges in a region that could otherwise only be traveled by horseback

➤ A CAVE provided the framing for this view of the fantastic fingers of stone that form the Needles of southeastern Utah

THREADING UTAH'S NEEDLES





▲ A REMARKABLE COLLECTION of pictures pecked in the rock by earlier people. An Indian shooting an elk with a bow and arrow, animals of several kinds, and grotesque figures in wide variety can be seen here



▼ MAN AND JEEP shrink to ant size amid the towering rocks



of the landscape that was around us.

Everything in the region, including the geologic history, leads to the Colorado River. Aided by its tributaries, the great stream has cut down through about 5000 feet of rock, exposing all the major formations that the earth spent so long in building.

The Cutler Formation, including the Cedar Mesa sandstone from which the Needles have been carved, was laid down at the close of Paleozoic times. It is a mere tissue paper thickness in relation to all the sandstones, limestones, and shales that were placed, one upon the other, during the 430 million years of the Paleozoic and Mesozoic eras. Temporarily, at least, the Cedar Mesa sandstone has been assigned to the Permian age, 205 to 230 million years ago. That was the time when the reptiles were beginning to appear on earth.

The rock of which the Needles

are made is old, but the Needles themselves are young. There was folding and warping, and new rocks were laid down upon the old, but only during the last few million years have the rivers been chiseling the present landscape. So, the Needles, though their roots lie deep and their texture reflects the sunlit sand of ancient shores, are nevertheless fairly modern shapes.

Even the practical-minded scientist admits that the earth may never have been as beautiful as now, and we were vividly aware, here among the Needles, of our privilege in being alive.

Satan's Playground

A new day found us working our way, wheel-turn by wheel-turn, through an irregular, boulder-trimmed pass, leading into Devil's Lane and Devil's Pocket. Probably some cowboy, chasing stray cattle, had let off steam by applying these names.

"Was part of his dissatisfaction due to a lack of drinking water?" I asked our guide, recalling that breakfast coffee had used up the last of our supply.

"Not if he'd ever been here before," the guide replied. To prove it, he led us over slick rock and up a slope that bore scratches from



◀ AN ANCIENT WATCHTOWER built by prehistoric Indians: one of many remnants of the people who once made this part of southeastern Utah their home

▲ PILLARS in Salt Creek. In the foreground, the bed of an intermittent stream is sandy and smooth, forming a regular highway beneath the canyon walls





▲ TRIANGLE ARCH in Lavender Canyon: one of many such formations to be seen in the red sandstone bastions of the Needles area



horseshoes, to a large pothole full of clear water. For some days after any sudden summer shower, both rider and animal could count on a long drink.

Since it was now only a few miles to the Colorado River, we joggled over. Here the Green River joins the Colorado, and the two canyons form a huge Y. The Green's grayish-green torrent pushes out halfway into the Colorado's redder flood, keeping its identity of coloring long enough to say that the two

rivers flow in the same bed for a little time. Blending, they sweep out of sight around a bend, still appearing smooth from our breathtaking vantage point 2000 feet above. But only a mile downstream, we knew that they entered perhaps the most strenuous 40 miles of their journey—Cataract Canyon.

We camped that night back in the Needles, near a bubbling spring. Elephant Spring, to justify the name given it, displays rocks shaped like trunks, rounded backs,

and squat, stubby legs.

Still another day found us threading our way out of the Needles and into range lands where a single cattle outfit brings its herd down for winter pasturage. We turned aside to explore a little in Salt Creek Canyon, which comes in from the south. The bed was sandy and smooth, a regular highway between canyon walls. Every now and then, we spotted prehistoric dwellings. There must once have been a large population, tilling fields in little valleys outside the canyon. Rock shelters out of reach of animals gave protection to their food stores and kept them dry. Several accessible caves near the floor of the canyon had paintings and petroglyphs pecked out with rock tools.

Lavender Canyon

Beyond Cave Springs, our route could almost be called a road. There would have been no more boulder dodging or sand traps if we hadn't decided that Lavender Canyon was too promising to miss. We had passed North and South Six Shooter Peaks and crossed Indian Creek. Not many days before, a flash flood had ripped through, uprooting trees and moving every rock it could. We lost time digging the jeeps out of deep sand several times, some of it "quickie," but the canyon walls were wonderful to see, with lavender bands decorating the red sandstone. Here again were caves containing cliff dwellings. There were little granary cists, some with walls intact, others tumbling down. From differences in construction, we felt sure they represented the work of many generations of people who gradually became more skillful in construction or learned new tricks from more advanced folk.

Even without these vestiges of a vanished people, Lavender Canyon would have been worth the trouble. The sandstone was cut into great embayments and overhangs at the base of the cliffs. Far above, we saw lovely windows, arches, and leaning walls. One of the arches

was an almost perfect equilateral triangle. We christened a second span Fern Arch, in respect to Kent Frost's wife. Through frames of trees along the watercourse, we had a continual procession of rock vistas, half-formed rainbows in stone, soaring ledges, and precipitous cliffs, filigreed with watermarks and cross-bedding.

Rock Pictures

Indian Creek, which led us back toward the highway, was another center of prehistoric life. Pecked into a sheltered rock face were the petroglyphs shown in one of the photographs — one of the largest collections any of us had ever seen. A careful study of these symbols might show how long the creek has been a host to man. It could well span the entire Christian era,

since other parts of the region have yielded relics as old. Several clearly recognizable horseback riders, one of them in the act of shooting an arrow into the flanks of a retreating elk, could not have been made before the Spanish brought the horse to the Southwest in 1540. Other elk scamper across the record as do bighorn sheep, perhaps an antelope or two, and one possible buffalo. The minds of the artists were certainly on game, but they had time for drawing hands and feet, whole human figures, skins laid out to dry, snakes, and formal designs.

A lovely tower stood in ruins, where it might have served as a lookout from the valley floor, from

which workers out in the fields could be warned of the approach of an enemy.

Dugout Ranch was our first touch of civilization. From there we mounted slopes that led to the Blues (local name for the Abajo Mountains) and worked our way northeast to U. S. 160, fourteen miles north of Monticello.

That night we had a meal at a table, sheets on a soft bed, and a private bath. They were welcome, but I'm ready to exchange them any day for an uncertain trail, with a surprise over every rocky uplift, where spires of many colors puncture the sky, deep in the rocky wilds of the Needles country.



▼ BEYOND THE RANGE of common cars, the stream bed of Salt Creek Canyon, between wonderfully carved walls, provides a thrilling panorama for the jeep traveler





▲ *A pre-storm sky warned of the approach of unsettled weather at 5:30 on the evening of February 19. Here three different layers of clouds were moving in different directions. Intermittent light rain fell during the night*

Painting the Sky

The water colors of Helmut Siber give rich interpretation to an aspect of nature to which few painters have brought scientific understanding



▲ Sunrise showed whitish through high stratiform or cirro-stratus clouds. The Balsam Range is seen indistinctly in gray merging with the gray of alto-stratus near the horizon. Wind-torn clouds are coming in at 5000 feet from the south

THE six paintings reproduced here from an exhibit to be held at the American Museum of Natural History during December portray the development of a fierce storm that occurred last February 20, over the Balsam Range in North Carolina. They are among the latest works of Helmut Siber, whose inspiration to paint the weather came when he went to sea in 1923. He had devoted several years to art training in his native Germany, but it was on vessels that took him to the Far East and elsewhere that he resolved to portray the sky in all its changing moods. He soon came to realize how important it is for an artist to understand the

dynamics of any natural phenomenon he wishes to depict. Earlier practice in drawing animals in motion helped him to develop the facility of speedily rendering changing cloud conditions.

Speed and Anatomy

"To draw a tiger or leopard as it prepares for a leap," says Mr. Siber, "it is essential not only to experience the impression of the stupendous concentration of power that is taking place but to have a knowledge of the anatomy of the animal. The artist faces a similar problem when he attempts to paint the weather. Here also it is necessary to understand the laws gov-

erning the movement. One must know the conditions under which clouds form, move, and disintegrate."

Many of Mr. Siber's paintings have been made in the Great Smokies and other mountains of the Appalachian system, for mountain ranges often are "weather breeders" and sometimes act as barriers to the movement of air masses. When air masses move across the continent and meet these barriers, mixing, eddying, and turbulence may result, and these activities of the atmosphere are Mr. Siber's specialty.

"Stormy weather always sends indications ahead," he says. "To paint



◀ *By 9:00 in the morning, the storm had arrived. A mixture of rain and snow is falling, and violent westerly winds are rushing across the valley*



◀ *The effect of the barrier. Updrafts in thunderstorms are developing over the mountains and holding up horizontal movement. Rain is falling over the ranges, which fade away into the distance*



holding your own against a great hostile onslaught. This is quite different from reading about meteorology in a quiet library. When you are alone on a high mountain and a full-fledged storm develops, you feel and learn to know the interaction of immense natural forces. To record succeeding phases of the storm, when clouds are traveling at different levels and in different directions, it is necessary to use your colors with great speed. When the artist succeeds in this task, his painting captures something of the movement and presents a living impression that quite transcends the effect of a photograph, which necessarily 'freezes' the scene at a given instant.

◀ *"As if the earth were breathing," mists rose during intervals between rainfall. The ridges can be seen through the fog*

Comparatively New Science

"The science of meteorology is comparatively new, which may explain why artists have not taken hold of this most dramatic and fascinating display of nature. The English painter John Constable made a serious though brief study of clouds, and it is perhaps significant that it was in his time that the classification of clouds was first attempted, by Luke Howard, who published his analysis in 1803. Turner's skies more often give a poetic than a correct account of an event in nature."

The six pictures shown here begin with the first signs of turmoil on the evening before the storm and continue with the development through the following day to clearing at evening. A great air mass

was crossing the continent, with tornados in the wake of the front in Texas, Mississippi, and Louisiana. By noon of February 20, it had reached the mountain barrier of the Great Smokies and the Balsam Range. Mr. Siber recorded this encounter as the front pushed against the ridges. The wind built up steadily from a strong breeze to a full gale, with clouds forming hard against the mountains. It became necessary to work faster and faster, and also to look out for rain or snow so as to be ready to withdraw under a roof or a projecting rock wall to protect the painting, on which the touch of rain would cause irreparable damage. Heavy rain fell in the valley and snow on the mountains from an elevation of 4000 feet up to the

6000-foot summits. Many trees were brought down by the fury of the wind, and others were splintered by lightning.

Between the heavy wind and downpour, brief periods of calm set in, during which fog and mist would seem to rise out of the valleys and out of the crevices in the mountain slopes, "as if the great earth were breathing," to quote Mr. Siber. Then a new thunderstorm would develop, and the upheaval would resume.

Toward dusk, the cloud layers broke apart, and patches of blue sky became visible through an opening in the confused cloud decks. The air was pure and fresh, scented by sweet pine and filled with the songs of robins in the valley.

▼ *The storm has passed. The clouds are moving out to the Atlantic, and patches of clear sky are appearing in the west (upper left)*

*All photographs by
Taylor and Dull*





Useful Drugs from TOADS?



By

CHARLES M. BOGER

*Chairman and Curator,
Department of Amphibians and Reptiles,
The American Museum of Natural History*

◀ THE G
TOAD be
milked o
venom in th
terests of
cal science



With photographs by
R. E. Atkinson

▲ WHEN the large parotoid gland is squeezed, the poison spurts out. It serves to protect the toad against enemies; substances derived from it may protect man against disease

The creature unjustly accused of causing warts now finds a place in the sun as a possible teammate in the fight against circulatory ailments

EARLY one morning as I worked along the edge of a river on the west coast of Mexico, I noticed a small boy following me. He watched with obvious interest while I occasionally extracted a huge toad from beneath a boulder. As I dropped a specimen into a sack, he stared with amazement and then commented, "Echan leche (They throw milk)."

I realized that it was a pertinent observation. As a small boy, I too had pinched the large glands behind the heads of toads and

watched the droplets of whitish liquid ooze out. In fact, I'd gotten some of the liquid on my lips and had found that it was extremely bitter and unpleasant to taste. It was fortunate that a drop of the liquid had not landed in my eye. This can be a painful experience and may even cause temporary blindness, for the thick, milky fluid is a potent poison.

Presumably it is the warty skin of the toad that has given rise to the myth that "toads give warts." Actually the protuberances on the

skin of the toad are poison glands. They are the toad's solution to the problem of keeping from being devoured. The leaping ability of most frogs and many other tailless amphibians protects them from enemies. During his long evolution, the relatively slow-moving toad has come to depend less upon his muscles and more upon being distasteful. As many a would-be predator has learned to his sorrow, a toad in the mouth can be downright dangerous.

If left alone, few animals are

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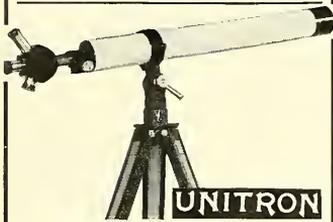
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less obnoxious—or more beneficial to the garden—than the toad. But if the animal is seized or mistreated, for example by a dog, its poison is brought into play. It pours out on the surface of the skin, particularly from the larger glands (called the parotoid glands) behind the head. After an encounter with a toad, a dog or other animal may froth at the mouth or even vomit. In extreme cases, death may ensue, particularly when one of the larger species of toads is involved.

From the earliest times, toads have been regarded as venomous. In the Talmud, the toad is distinguished from the frog and classified with animals whose touch contaminates. Shakespeare speaks of the toad as "ugly and venomous," and the name *calamita* (from the same root as our word "calamity") was applied to a European toad in 1768. A Brazilian in 1878 observed that in his country there existed a toad, "a veritable giant — whose venom would be worth while to study. It is very probable that this is the species from which the aborigines of the Amazon derive the poison with which they smear the points of their arrows, in place of a sort of curare that certain other tribes use."

Experiments carried out by pharmacologists three decades later confirmed the Brazilian's belief. In 1912, two men working at Johns Hopkins University, John J. Abel and David I. Macht, concluded that the poison of the Giant Toad would indeed be a very deadly one when used as an arrow poison. However, their primary interest in the animal's excretions lay in their search for useful drugs. Since prehistoric times, people have realized that poisons may have medicinal value. The Chinese have long used a preparation derived from toad skins as a remedy for various diseases. As early as 1672, "powdered toad" was recommended by pharmacologists in Europe as a cure for dropsy, nose-bleed, and other ailments.

Encouraged by their knowledge of these ancient usages, Abel and Macht undertook an analysis of the

excretions from the enormous glands of the large American toad. They found that they could isolate two principles. One was an amino alcohol, with properties similar to drugs formerly used to stop bleeding as well as in the treatment of shock. The other one they called "bufagin," noting that it had many tonic and diurectic properties similar to those of digitalis, a drug long in medicinal use. They concluded that the chemical purity, keeping qualities, and other properties of bufagin warranted trial usages of the substance for medicinal purposes.

More recently research workers with the National Heart Institute have renewed the search for useful elements in the Giant Toad's venom. With more refined techniques than those available 40 years ago, they have discovered a substance in the venom of the Giant Toad that is identical with one called serotonin, found only a few years ago to be present in the blood of human beings. Prior to their finding serotonin in toad venom, it had only been possible to isolate relatively small quantities from hundreds of tons of beef blood. In human beings it is held captive in the colorless discs in the blood called platelets, but when injury ruptures the platelets, serotonin is released in minute quantities, causing the walls of the blood vessels to contract. Seemingly it is involved in the normal mechanism that stops bleeding.

Thus serotonin, available in large quantities in the venom of the Giant Toad, may be put to use in the treatment of human ailments. It is a potent substance, and research is now being carried on with radioactive "tags" attached to one of the carbon atoms in serotonin in an effort to discover whether it is involved in the chemical processes of the body that are upset when diseased conditions occur.

Doubtless much work remains to be done, but once again the "ugly toad" may contribute to man's well-being. The venom that protects the toad from its enemies may provide a substance that will protect man from his worst enemy—disease.



Hawaii Visitors Bureau Photo

▲ A STREAM of red hot lava—typical of Hawaiian volcanoes—flowing like molasses into the ocean

River of ROCK

Mauna Loa, one of the most active volcanoes in the world,
poured out this cascade of incandescent lava in its record performance

By MARY DANA RODRIGUEZ

WHEN Hawaii's great Mauna Loa volcano erupted in 1950, rivers of lava cascaded into the sea like the one pictured above. This spectacular eruption lasted 23 days and was the greatest of recent times in terms of the amount of lava produced.

Through the past century the two live volcanoes on the island of Hawaii, Mauna Loa and Kilauea, have been among the most active in the world. But unlike most other volcanoes, those of Hawaii are gentle

in their action and can be approached with safety.

Mauna Loa has averaged one eruption every three and one-half years since 1932. There has been a very rough alternation of activity between eruption in the summit crater and lava flows on the flanks. Most of the flank eruptions take place on one of two zones of fissures, which extend respectively to the northeast and southwest from the summit.

Considering the part under water,

Mauna Loa is perhaps the largest single mountain mass on earth. It rises 13,680 feet above sea level, and its crater, called Mokuaweoweo, is about three miles long and one and one-half miles wide.

The island of Hawaii is referred to by the natives as "The Big Island," and it actually is the largest of the archipelago. But it is also the youngest, at least in the sense that it is still growing. Its shoreline increases from time to time from lava flows.



▲ "WEST OF ZANZIBAR" deals with the ivory poaching racket in Africa and the coastal islands

The Screen Authentic comments on films in the field of nature, geography, and exploration

Edited by ELIZABETH DOWNES

"West of Zanzibar"

FOR THOSE of our readers who enjoyed "The Ivory Hunter," "West of Zanzibar" will come as welcome entertainment, for it is somewhat of a sequel to it. This time the Park Commissioner is involved with the problems that arise from the impact of civilization on the native tribes as brought into focus in the ivory poaching racket.

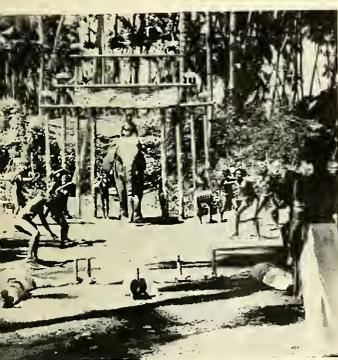
Mr. T. Donald Carter of the American Museum's Department of Mammalogy in reviewing the film writes: "The young men of a local tribe, the Galanas, have been influenced to hunt ivory for the poachers, much against the advice of their chief, Ushingo. Bob Payton, a Park Warden, has always been on friendly terms with the Galanas, but when he catches several of the young men in the act of killing an elephant and taking its ivory, he arrests them. Upon the pleading of his wife and the chief, he relents and



▲ THE PARK COMMISSIONER is faced with the inevitable problems that arise when native populations have contact with civilization



"THE BEACHCOMBER," based on Maugham's short story "The Vessel of Wrath," follows the original closely until the end



A DEUS EX MACHINA in the form of an elephant that never forgets is introduced in the movie plot



THIS TROPICAL ISLAND PARADISE is hard to place geographically

free the boys. He then decides to track down and bring to justice the man who led the natives astray, the head of the poacher ring. In this he ultimately succeeds, but only after furious encounters with the smugglers, in which the Galanas come to his aid.

"There are the usual shots of big game, including elephants and hippopotamuses; an interesting river scene in which an entire village goes fishing, and a short sequence of fishing for turtles with remoras. The most appealing scenes are of the stately dhows in and around Mombasa harbor. These sailing vessels play an important part in the picture."

"West of Zanzibar" is a Universal-International release, filmed on location.

"The Beachcomber"

Reviewed by

GORRON F. EKHOLM
Associate Curator of Archaeology
American Museum of Natural History

LIKE MANY of Somerset Maugham's stories, "The Beachcomber" (based on the short story "The Vessel of Wrath") concerns the activities of a small group of Europeans living among a native population, in this case on a fictitious group of

islands somewhere in the Indian Ocean.

The original stories often give only enough about the habits and customs of the natives to highlight the actions of the Europeans who are the principal actors. Translating this into the greater 'realities' of the motion picture, however, the producer must meet the problem of picturing a native people in their natural setting with many of the details of their daily lives. He finds this difficult to do because most real villages are rather dull places. So for an island picture, he makes up a village with some of the more glamorous elements he finds in the Indonesian or Polynesian cultures to suggest a tropical paradise. The usual result, as we find here, is something that really stumps an anthropologist when he tries to guess where the place could be.

We might point out some of the particular anthropological inconsistencies, but this hardly seems worth while for a picture that is lacking in more important ways. It appears woefully contrived and unconvincing, and does not succeed in the least degree in imparting the mood of mystery or suspense, which I suppose, must have been intended.

This is a J. Arthur Rank production, released through United Artists.

Brief comments on films

Documentary and Grade A

African Adventure

Primarily concerned with the hunting and killing of animals

Will appeal primarily to sportsmen

The Royal Tour of Elizabeth and Philip

Beautiful and elaborate dance scenes, memorable scenery

Native customs that have become part of the pageantry of a world society on a wider stage: dignified

Robinson Crusoe

Deviations from original plot well handled

Even Defoe would probably be pleased with this rendition

The Vanishing Prairie

A Disney film dealing with the vanishing wildlife of the American Prairie

Exciting, instructive, and highly entertaining

Down the Alphabet

Drum Beat

Story of Modoc war, Hollywood fashion, filmed in Coconino Nat'l Forest

Horse opera, good scenery, lots of gun fights and wrestling matches, usual love triangle where the Indian girl loses out

The Egyptian

Based on the book by the same name

An interminable and pretentious film

Fire Over Africa

Melodrama filmed in Spain and northern Africa

Not natural history

Quest for the Lost City

Adventures of the Lambs, during their quest to discover a lost Maya city

Incredibly contrived piece of nonsense

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BOOKS

continued from page 439

the essential facts of the world's energy and mineral cycles are well summed up. Detailed consideration is given to the various ways in which we now exploit the sea and the extent to which increased effort along similar lines might increase the yield.

The conclusions reached are far from optimistic. The authors definitely do not believe in miracles. Instead, they believe that man's conquest of the oceans—the earth's last frontier—will come only when we make an effort to bring it about. Our present expenditure of less than one per cent of what is spent annually in solving agricultural problems on land clearly indicates that although two-thirds of the world's population is ill-nourished, we are not yet really taking the potentialities of the sea very seriously.

R. H. POUCH

NANGA PARBAT

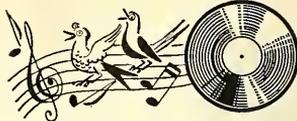
by Karl M. Herrligkoffer

Alfred A. Knopf, \$5.00
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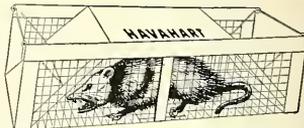
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existed near enough to the summit for the climatic all-out assault.

The first parties had much exploration to do before a choice of itinerary for the climb could be decided. Considerable hardship was involved before even half the mountain's height was achieved. A scarcity of packers, and those available untrained and reluctant, aggravated the situation. Storms, snow, ice, below-zero temperatures, ice falls, and avalanches were frequent factors, and when exhausted individuals or an entire party lay asleep in camp, death took a heavy toll.

The greater part of the book is devoted to the day-by-day story of how an Austro-German expedition placed one of its members on the highest peak of Nanga Parbat. For readers who react to the challenge and rigors of nearly prohibitive mountain environment, this story carries a thrill. Excellent halftones bear ample testimony to the stark and forbidding menace of Nanga Parbat, beautiful but terrible.

HAROLD E. ANTHONY

AMPHIBIANS AND REPTILES OF WESTERN NORTH AMERICA

----- by Robert C. Stebbins
McGraw-Hill Book Company, Inc., \$8.50
528 pp., 52 figs., 104 pls.

HANDBOOKS have become increasingly better as our knowledge of the various groups of animals improves. This top-notch guide to the amphibians and reptiles of western North America north of the Mexican boundary is no exception. With liberal use of illustrations, maps, and keys, in addition to the text, it provides an excellent summary of distribution, habitat, habits, and appearance of each of the species. These include the 15 salamanders, 29 frogs, 13 turtles, 59 lizards, and 70 snakes, inhabiting the area from the western edge of the Great Plains to the Pacific.

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C. M. BOCERT

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LETTERS *continued from page 514*

scene. Perhaps some of your readers will feel as I do that this wonderful Park should not be marred by building operations of any permanent kind, which would be an eyesore to the many who visit the Park in summer for relaxation and inspiration in nature.

It is true that there are many travelers who seek only to engage in sports or take a "Coney Island" ride. But there are other areas where these activities can be developed without desecrating one of the most

sublime spots in our country, which was set aside for another kind of inspiration.

Some may feel that no structure of this sort should be permitted at Mt. Rainier. Others may be satisfied to restrict operations of this sort to the back of the mountain or to require the "lift" to be taken down during the summer months. But everyone who has any feelings about this should let his Congressman or The National Park Service know while there may still be time to influence the decision.

MRS. CHARLES C. MARSHALL

New York, N. Y.

BOLIVIA'S ADVENTURE IN LEARNING *continued from page 447*

teachers he has trained in spraying had much more to show us, and we washed their feet in tubs and center of the big enclosure girls from the home-life courses were preparing lunch at the outdoor stoves.

We were ready to drop when we returned to the school, but our tour was not over. Since it was All Souls' Day, the classes were not in session, but the director showed us where the students were busy repairing the springs of a bed, finishing up benches of cactus wood, and weaving on big looms.

After lunch, Dr. Hart and his staff continued with a round-table session with the director and the teachers, some of them from the sectional schools, and then we went to visit one of the sectionals about a dozen miles away. There were 26 others, some two days distant by truck.

This little country school of adobe painted white was empty. But our guides took us up a steep hill, through a brown Old Testament landscape, to a reservoir filled with water. Here supervisors had persuaded the people that they could provide themselves with a supply of water for their fields. The water had been brought from a spring in lined ditches to this reservoir, which the men had just finished.

We Gringos all collapsed on the stone wall to get our breath. In a few minutes, we saw a brightly

colored stream of people flowing up the hill. The matrons, wearing little derby hats and carrying babies on their backs, came to shake hands and to say we were welcome. I mentioned to Señor Torranzos how poised they were, how different from the Aymaras in other places. He said, "It's the influence of Chile. The young women go over there and get jobs as domestics, and they come back with a little more knowledge of the world. Another extraordinary difference down here," he added, "is that the girls outnumber the boys in some of the sectional schools. Elsewhere, 10 girls out of 150 students may be considered quite a record."

Since the right characters had casually assembled, a brief impromptu dedication was held, and Dr. Hart in "taking the word" said that this water system was good evidence that the Lord does indeed help those who help themselves. These hospitable people, gathered around their little reservoir in their folklore costumes, had for me, the complete outsider, something of the quality of a vision. Here in their isolated, barren corner of the great Altiplano, they were bent on creating a fuller life for themselves. They put a high value on the knowledge and skills brought in by the technicians. And for them the Inter-American Cooperative Service signified among other things that their ambitions and struggle meant something to the outside world.

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